

United States Coast Guard

Response Boat – Medium (RB-M)

SPECIFICATION

DTCG23-03-C-ARB065

DTCG23-03-C-ARB066

DTCG23-03-C-ARB067

SECTION J, ATTACHMENT 1

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SECTION 0: GENERAL GUIDANCE AND ADMINISTRATION

042 GENERAL ADMINISTRATIVE REQUIREMENTS

042-1 General Requirements

042-1.1 This Specification describes the general administrative requirements, technical requirements, and information defining the work and responsibilities required by the Contractor for the design, construction and delivery of the U.S. Coast Guard Response Boat – Medium (RB-M).

042-1.2 Items followed by the word (*threshold*) are to be considered as minimum requirements or performance. Items followed by the word (*objective*) represent desirable or added-value items or performance criteria that are not required, but may be offered by the Contractor. Items not followed by the words (*threshold*) or (*objective*) shall be treated as threshold requirements and performance criteria.

042-1.3 The objective items are summarized in Table 042-1 along with the primary specification reference. The list is in priority order with items at the top of the list considered a higher priority than those at the bottom.

Table 042-1 Objective Requirements

<u>Objective</u>	<u>Primary Reference</u>
Reduced Operational Draft	070-1
Increased Towing	051-4
Increased Top Speed	051-1
Self-Righting for Survivability	079-4
Alternate Helm Station	070-2
Reduced Noise Levels	073-1
Infrared (IR) Camera System	439-1
Compliance with 2004 Emissions	233-1

042-2 Definitions

042-2.1 RB-M, "the boat" and "the craft" all refer to the U.S. Coast Guard Response Boat – Medium as defined in this Specification.

042-2.2 GFE – Government Furnished Equipment.

042-2.3 Wave Heights – Where mentioned, sea heights or wave heights are defined as significant wave heights (H 1/3) as defined by the Society of Naval Architects and Marine Engineers in Principles of Naval Architecture, Vol. III (1988).

042-2.4 Loading Conditions:

042-2.4.1 Light Condition: The boat is complete, with service life margin, and ready for service in every respect including outfit and onboard spares. Liquids in machinery shall be at operating levels. This condition does not include crew or fuel.

042-2.4.2 Hoisting Condition: Light Condition plus a full load of fuel and water.

042-2.4.3 Minimum Operating Condition: Light Condition plus 1/3 load of fuel and water, plus four crew.

042-2.4.4 Normal Operating Condition: Light Condition plus full load of fuel and water, plus four crew.

042-2.4.5 Full Load Condition: Light Condition plus full load of fuel and water, plus four crew and five passengers.

042-2.4.6 Full Load Condition with Cargo: Full Load Condition plus 900 pounds.

042-2.4.7 Crew and passenger weights shall be 180 pounds per person when calculating weights.

042-2.5 Service Life Margin: 600 pounds located on centerline, with its vertical center of gravity at the sheerline and its longitudinal center of gravity at the same location as the Full Load Condition. This margin accounts for the future growth of the RB-M while in Government service.

042-2.6 When accelerations are referred to in “g” or “gravities”, this shall mean a multiple of the acceleration of gravity, 32.2 feet per second per second. Note that in the vertical plane, this is added to the existing acceleration of gravity.

042-3 Referenced Documents

042-3.1 Throughout this Specification, where only the basic Government specification, standard, drawing or publication number is used, and prefix zeros or suffix letters which identify amendments or revisions are not given, the amendment or revision in effect as of the date of release of this Specification shall apply.

042-3.2 Where industry standards are referenced, the issue or revision in effect on the date of release of this Specification shall apply.

042-3.3 The recommendations cited in all Construction Standards listed in 042-4 and 042-5 shall be interpreted as requirements for this Specification. Throughout the referenced texts, the words “may” or “should” shall be replaced by the word “shall,” and the word “recommended” shall be replaced by the word “required.”

042-3.4 Consistent with FAR Clause 52.215-8, the additional order of precedence applies:

- The Schedule (excluding the specifications).
- Representations and other instructions.
- Contract clauses.

- Other documents, exhibits, and attachments listed in Section J.
- The specifications.
- Government specifications and standards, industry standards, and similar documents listed herein.

042-3.5 The Contractor shall notify the Government of contract or specification requirements that deviate from Government and industry standards in such a way as to cause Government liability, void product warranties or reduce the inherent safety of the vessel.

042-3.6 Silence of one document with respect to details shown in another shall not be considered an inconsistency.

042-4 Construction Standards

042-4.1 At a minimum, RB-M shall be built according to the following construction standards:

American Boat and Yacht Council, Standards and Recommended Practices for Small Craft, July 2002.

A-4	FIRE FIGHTING EQUIPMENT
A-6	REFRIGERATION AND AIR CONDITIONING EQUIPMENT
A-16	ELECTRIC NAVIGATION LIGHTS
A-20	BATTERY CHARGING DEVICES
A-23	SOUND SIGNAL APPLIANCES
A-24	CARBON MONOXIDE DETECTION SYSTEMS
A-25	POWER INVERTERS
E-2	CATHODIC PROTECTION
E-4	LIGHTNING PROTECTION
E-8	ALTERNATING CURRENT (AC) ELECTRICAL SYSTEMS ON BOATS
E-9	DIRECT CURRENT (DC) ELECTRICAL SYSTEMS ON BOATS
E-10	STORAGE BATTERIES
H-4	COCKPITS AND SCUPPERS
H-22	ELECTRIC BILGE PUMP SYSTEMS
H-27	SEACOCKS, THRU-HULL CONNECTIONS, AND DRAIN PLUGS
H-30	HYDRAULIC SYSTEMS
H-31	SEAT STRUCTURES
H-32	VENTILATION OF BOATS USING DIESEL FUEL
H-33	DIESEL FUEL SYSTEMS
H-40	ANCHORING, MOORING, AND LIFTING
H-41	REBOARDING MEANS, LADDERS, HANDHOLDS, RAILS AND LIFELINES
P-1	INSTALLATION OF EXHAUST SYSTEMS FOR PROPULSION AND AUXILIARY ENGINES
P-4	MARINE INBOARD ENGINES AND TRANSMISSIONS
P-6	PROPELLER SHAFTING SYSTEMS
P-14	PROPULSION CONTROL SYSTEMS
P-17	STEERING SYSTEMS FOR OUTBOARD, INBOARD, STERNDRIVE AND WATERJET DRIVE BOATS
P-21	MANUAL HYDRAULIC STEERING SYSTEMS
P-22	STEERING WHEELS
P-24	ELECTRIC/ELECTRONIC PROPULSION CONTROL SYSTEMS
T-5	SAFETY SIGNS AND LABELS
T-17	COMPASS INSTALLATION

TH-23 DESIGN, CONSTRUCTION, AND TESTING OF BOATS IN CONSIDERATION OF
CARBON MONOXIDE
TY-28 BOAT LIFTING AND STORAGE

042-5 Construction Standards - as cited herein

042-5.1 At a minimum, the RB-M shall be built according to the following construction standards as cited herein:

Code of Federal Regulations (CFR), Title 40 (Protection of Environment).

Code of Federal Regulations (CFR), Title 46 (Shipping).

Code of Federal Regulations (CFR), Title 49 (Transportation).

American Bureau of Shipping (ABS) Guidance Manual for Bronze & Stainless Steel Propeller Castings, 1984.

American Bureau of Shipping (ABS) Rules for Non-destructive Inspection of Hull Welds.

American Iron and Steel Institute, AISI 302.

American Iron and Steel Institute, AISI 304.

American Iron and Steel Institute, AISI 316L .

American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A Table 1A, 1B, 1C or 1D.

American Society for Nondestructive Testing (ASNT) Central Certification Program (ACCP).

American National Standards Institute (ANSI) ANSI-C84.1 Electric Power Systems and Equipment.

ASTM International, A276-02, Standard Specification for Stainless Steel Bars and Shapes.

ASTM International, A312/A312M-01a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

ASTM International, B179-96, Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Castings Processes.

ASTM International, B209-01, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

ASTM International, B210-00, Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

ASTM International, B221-00, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

ASTM International, B241/B241M-00, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

ASTM International, E1417-99, Standard Practice for Liquid Penetrant Examination.

ASTM International, E165-02, Standard Test Method for Liquid Penetrant Examination.

ASTM International, E94-00, Standard Guide for Radiographic Examination.

ASTM International, F1166-95a(2000), Standard Practice for Human Engineering Design for Marine Systems, Equipment and Facilities.

American Welding Society (AWS) A5.1, Filler Metal Specifications.

American Welding Society (AWS) B1.11:2000, Guide for the Visual Examination of Welds.

American Welding Society (AWS) B2.1:2000, Specification for Welding Procedure and Performance Qualification.

American Welding Society (AWS) D1.1/D1.1M:2002, Structural Welding Code – Steel.

American Welding Society (AWS) D1.2-97, Structural Welding Code – Aluminum.

American Welding Society (AWS) D3.7-90, Guide for Aluminum Hull Welding.

International Electrotechnical Commission (IEC) 60529 Ingress Protection (IP) 55, (IP) 56.

Institute of Electrical and Electronics Engineers (IEEE), Inc. Standard 45-1998, IEEE Recommended Practice for Electric Installations on Shipboard, 1998.

International Organization for Standardization (ISO) 3046-1:2002,- Reciprocating internal combustion engines -- Performance -- Part 1: Declarations of power, fuel

and lubricating oil consumptions, and test methods -- Additional requirements for engines for general use.

International Organization for Standardization (ISO) 484-2:1981,- Shipbuilding -- Ship screw propellers -- Manufacturing tolerances -- Part 2: Propellers of diameter between 0,80 and 2,50 m inclusive.

International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Annex VI, Prevention of Air Pollution from Ships.

MIL-STD-769J - Thermal Insulation Requirements for Machinery and Piping.

MIL-STD-1310G - Department of Defense Standard Practice for Shipboard Bonding, Grounding, and other Techniques for Electromagnetic Compatibility and Safety.

MIL-STD-1623D - Fire Performance Requirements and Approved Specifications for Interior Finish Materials and Furnishings.

MIL-STD 2035 - Nondestructive Testing Acceptance Criteria.

Naval Sea Systems Command (NAVSEA) 0900-LP-060-4010 .

Naval Sea Systems Command (NAVSEA) 0900-LP-001-7000, Fabrication and Inspection of Brazed Piping Systems.

National Marine Electronics Association (NMEA) 0183 Interface Standard.

National Electrical Manufacturers Association (NEMA) 250-1997, Enclosures for Electrical Equipment (1000 Volts Maximum).

Naval Ships' Technical Manual (NSTM) S9086-CN-020/CH079 - V3 Damage Control Engineering Casualty Control - Volume 2 Section 24.

Society of Automotive Engineers (SAE) Standard AMS-2431a Peening Media General Requirements.

Society of Automotive Engineers (SAE) Standard AMS-QQ-A-250/8 Aluminum Alloy 5052, Plate and Sheet UNS A95052.

Society of Automotive Engineers (SAE) Standard J1475, Hydraulic Hose Fittings for Marine Applications.

Society of Automotive Engineers (SAE) Standard J1942/1, Qualified Hoses for Marine Applications.

Society of Naval Architects and Marine Engineers (SNAME) Ship Technical Operation Bulletin 4-16, Calculations for Merchant Ship Heating, Ventilation and Air Conditioning Design.

Coatings and Color Manual, COMDTINST M10360.3.

Navigation Rules, International - Inland, COMDTINST M16672.2.

Naval Engineering Manual, COMDTINST M9000.6.

Polyurethane Coatings Exposure Control, COMDTINST 6260.30.

U.S. Coast Guard Navigation and Vessel Inspection Circular (NVIC) No. 5-86, Voluntary Standards for U.S. Uninspected Commercial Fishing Vessels.

U.S. Coast Guard Navigation and Vessel Inspection Circular (NVIC) No. 11-80, Structural Plan Review Guidelines for Aluminum Small Passenger Vessel.

042-6 References

MIL-F-16884J - Fuel, Naval Distillate.

MIL-L-2104 - Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service (FSC 9150).

Principles of Naval Architecture, Vol. I (1988), Society of Naval Architects and Marine Engineers.

Principles of Naval Architecture, Vol. III (1988), Society of Naval Architects and Marine Engineers.

Boat Crew Seamanship Manual, COMDTINST M16114.5B.

042-7 Document Sources

042-7.1 These documents may be obtained from the following sources:

Government Documents:

USCG COMDTINST
May be requested from the Contracting Officer.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Tel: 202-512-1800

<http://bookstore.gpo.gov/>

Industry Publications:

American Bureau of Shipping (ABS) Technical Publications
16855 Northchase Drive
Houston, TX 77060
Tel: 281-877-6306
<http://www.eagle.org>

American Boat and Yacht Council (ABYC)
3069 Solomons Island Road
Edgewater, MD 21037-1416
Tel: 410-956-1050
<http://www.abycinc.org>

American Iron and Steel Institute (AISI)
1101 17th St., NW
Suite 1300
Washington, DC 20036
Tel: 202-452-7100
<http://www.steel.org>

American National Standards Institute (ANSI)
1819 L St., NW
Washington, DC 20036
Tel: 202-293-8020
Fax: 202-293-9287
<http://www.ansi.org>

American Society of Mechanical Engineers International (ASME)
Three Park Avenue
New York, NY 10016-5990
Tel: 800-THE-ASME
<http://www.asme.org>

American Welding Society (AWS)
550 NW LeJeune Road
Miami, FL 33126
Tel: 800-443-9353
<http://www.aws.org>
Email: info@aws.org

American Society for Non-Destructive Testing (ASNT)
PO Box 28518
1711 Arlingate Lane
Columbus, OH 43228-0518
Tel. 800-222-2768
Tel: 614-274-6003
Email: mcintire@asnt.org
<http://www.asnt.org/>

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Tel: 610-832-9585
<http://www.astm.org>

Institute of Electrical and Electronics Engineers (IEEE)
1828 L Street, N.W., Suite 1202
Washington, D.C. 20036-5104
Tel: 202-785-0017
Fax: 202-785-0835
E-mail: ieeusa@ieee.org
<http://standards.ieee.org/>

International Electrotechnical Commission (IEC) 60529
3, rue de Varembe
PO Box 131
1211 Geneva 20, Switzerland
Tel: +41 22 919 02 11
Fax: +41 22 919 03 00
E-mail: inmail@iec.ch
<http://www.iec.ch/>

International Maritime Organization (IMO)
4 Albert Embankment
London
SE1 7SR
United Kingdom
Tel: +44 (0)20 7735 7611
Fax: +44 (0)20 7587 3210
E-mail: publications-sales@imo.org
<http://www.imo.org/>

International Organization for Standardization (ISO)

1, rue de Varembe, Case postale 56

CH-1211 Geneva 20, Switzerland

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Fax: + 41 22 733 34 30

<http://www.iso.org>**National Electrical Manufacturers Association (NEMA)**

1300 North 17th Street

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Rosslyn, VA 22209

Tel: 703-841-3200

Fax: 703-841-5900

<http://www.nema.org/>**Society of Automotive Engineers (SAE)**

400 Commonwealth Drive

Warrendale, PA 15096-0001

Tel: 877-606-7323

<http://www.sae.org>**Society of Naval Architects and Marine Engineers (SNAME)**

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Email: ccali-poutre@sname.org<http://www.sname.org/>**044 RB-M OPERATION****044-1 Concept Of Operations**

044-1.1 The RB-M must be a multi-mission capable boat operable from Coast Guard shore stations. The RB-M will normally be in the water and be ready to rapidly respond to any Coast Guard missions on very short notice or to conduct planned patrols and training. The primary role of the RB-M in these missions follows:

044-1.1.1 Search and Rescue (SAR) – As the primary response asset at a Coast Guard station, the RB-M will be required to conduct a wide variety of SAR missions. Typical missions will require the RB-M to rapidly get underway in response to a distress call, transit at the highest possible speed to a search area, conduct a search, and perform a rescue mission. Throughout the mission, it is vital that the RB-M crew be able to efficiently navigate the RB-M using real time data and displays with input from a number of navigational sensors. At the same time, the crew must be able to communicate among themselves, as well as with Coast Guard command and control

elements including stations, groups, aircraft and cutters. The crew must also be able to communicate with the person or vessel in distress, and other vessels or persons assisting in the SAR effort. Once the RB-M arrives on scene, the actions taken vary widely, but may include:

044-1.1.1.1 Recovery from the Water – The RB-M must be capable of retrieving people (able-bodied, unconscious or deceased) or material from the water. Typical operations involve the RB-M maneuvering into the prevailing wind or creating a lee where the rescue is to take place. Methods of recovery may vary depending on the RB-M design, however, no more than two crew members will be available to conduct the recovery operations. In the case of a man overboard where one or more Coast Guard crew end up in the water, it is important that they be able to get themselves back onboard unassisted.

044-1.1.1.2 Transfers – The RB-M must be capable of transferring crew members, other personnel, and equipment to and from another vessel to help provide damage control or medical assistance. Typical transfers include providing a crew member for onboard assistance, providing the Coast Guard P-6 dewatering pump, or moving an injured person in a Stoke's litter. Transfers will normally be conducted directly by coming alongside the other vessel or, when necessary, equipment will be transferred via water using tending lines. In the case of the water transfer, a line is attached to the piece of equipment (typically a dewatering pump in a watertight container) and the line is passed to the disabled vessel. The equipment is then lowered into the water and hauled to the other vessel. An additional line will lead back to the RB-M to help guide and recover the piece of equipment. A similar method is also occasionally employed for passing a salvage pump down the towline to another vessel. The RB-M is also expected to be a boarding platform for transferring personnel to assist people, minimize damage to property, and conduct inspections to ensure compliance with federal laws and regulations, or enforce laws. Generally, boarding operations are conducted with the RB-M and vessel to be boarded underway at speeds up to 9 knots, following a course deemed safe and suitable for the safety of all personnel. Boarding of vessels by the RB-M crew while both are underway requires that the RB-M helmsman match the speed of the vessel to be boarded while contacting the other vessel's hull at an angle to keep the vessels together. Upon completion of the boarding or transferring of equipment, the RB-M helmsman must break contact with sufficient speed and power to safely withdraw from the vicinity of the other vessel without causing damage to either the RB-M or the other vessel. Vessels not underway or incapable of getting underway will also be boarded from the RB-M.

044-1.1.1.3 Towing – The RB-M must be capable of towing disabled vessels astern and alongside. Typically, tows will be conducted astern until the RB-M reaches restricted waters or is maneuvering into a slip or alongside a dock. Aft tows can be connected directly to the end of the towline, or by using a bridle or pendant when the vessel being towed is not suitable for an easy towline connection. The towing line is passed to the disabled vessel by first passing a heaving line and then using the heaving line to pull the towline to the disabled vessel. Good communication between crew and helmsman during the towing operation is critical to success, particularly when high winds and seas are present.

044-1.1.1.4 Helicopter Operations – The RB-M crew must be capable of transferring people and equipment to and from Coast Guard helicopters. Personnel transfers are done using a rescue device (a rescue strop, a rescue basket or a Stoke's litter). Equipment transfers are similar except the equipment may be directly connected to the hoist line. Typical operations will require the

RB-M to maintain a steady course, with the wind off of the port bow, while the helicopter is maneuvered off of the port stern quarter. Transfers are either done directly or using a trail line. The helicopter trail line is a light line with a 5-pound weighted bag on the end that is lowered to the boat. The other end is attached to the rescue device via a weak link. The RB-M crew member will be required to retrieve the trail line and use it to guide the rescue device to the deck. In order to discharge the static electricity that may build up in the helicopter and rescue device, the rescue device is grounded using a grounding wand or by having the device touch the water or hull. Once the rescue device is loaded, the crew members help to guide it off the deck and tend to the trail line (if used) until it is clear of the boat.

044-1.1.1.5 Medical Assistance – The RB-M must have sufficient space to provide medical assistance to rescued persons. First aid is typically provided at the First Responder level, however, more advanced first aid may be conducted depending on the capabilities of the rescue personnel.

044-1.1.1.6 Fire Fighting and Rescue Assistance – The RB-M's primary mission in fighting fires on other vessels is to save lives, not property, and to protect the RB-M in a hazardous environment. In this role, the RB-M must be capable of coming alongside another vessel to retrieve persons in danger. Limited fire suppression may be provided using portable fire extinguishers or by rigging the dewatering pump with a fire hose and nozzle to provide a protective spray of water.

044-1.1.2 Recreational Boating Safety (RBS) – The RB-M crew must be capable of conducting RBS missions. Typical tasks include patrolling designated areas to monitor boating safety, conducting boardings and inspecting vessels for compliance with federal laws, and enforcing safety and security zones for recreational events. RBS missions are normally only conducted in calm and moderate sea and wind conditions to reduce the risk of injury to the personnel involved and damage to the boats.

044-1.1.3 Marine Environmental Protection (MEP) – The RB-M must be capable of supporting MEP missions. In many cases, the RB-M may provide the first line of defense in the MEP program by being the first to respond to a reported incident and coordinating the subsequent actions. The RB-M may be tasked with conducting routine MEP patrols, towing oil containment booms, and transferring specialized personnel and equipment to the incident scene. Transfers are typically conducted in manners similar to those used in a SAR mission. In addition, the RB-M may be the on-scene command vessel coordinating the actions of others, or be required to enforce safety zones around an environmental incident.

044-1.1.4 Enforcement of Laws and Treaties (ELT) – The RB-M must be capable of conducting ELT missions. The ELT program emphasis is on protecting living marine resources, preventing illegal drug trafficking, interdicting undocumented migrants at sea, and enforcing a wide range of federal laws and treaties. In performing these missions, the RB-M must be capable of: conducting patrols; monitoring illegal activity; coming alongside other vessels for boardings; interdicting potentially hostile vessels; detaining suspects or migrants onboard for transport to shore or to another vessel; and recovering undocumented migrants or contraband from the sea. Electronic communication with other Coast Guard and law enforcement assets, as well as the vessels under investigation, is vital to the mission. In addition, the RB-M must be capable of projecting an effective projection of force to compel compliance with laws and treaties, to deter

illegal activity, and to disable hostile or evasive targets. This projection of force may be provided by hand-held small arms as well as mounted light machine guns. During these operations, it is vital that the crew members on deck are able to maintain communication with the helmsman.

044-1.1.5 Port Safety and Security (PSS) – The RB-M must be capable of conducting PSS missions. The PSS missions primarily involve maintaining the safety of ports through the prevention of accidental damage to vessels and port facilities and preventing the intentional destruction, loss or damage to port assets as a result of terrorism or sabotage. In conducting these missions, the RB-M must be able to: conduct routine patrols; enforce security zones; come alongside other vessels, including large ships, for boardings; monitor illegal activity; detain suspects; and interdict potentially hostile vessels. Similar to the ELT mission, the ability to communicate with other assets and the ability to project an effective projection of force are vital to the PSS mission. The RB-M must also be road transportable to allow the RB-M fleet to be relocated in response to both planned and emergency events that require PSS.

044-1.1.6 Defense Operations/Contingency Preparedness (DO) – The RB-M must be capable of conducting missions in support of DO within the coastal waters of the United States and it's territories. In support of these missions, RB-M must be capable of: conducting routine patrols; enforcing security zones; coming alongside other vessels, including large ships, for boardings; monitoring illegal activity; detaining suspects; interdicting potentially hostile vessels; and disabling hostile or evasive targets. Similar to the ELT and PSS missions, the ability to communicate with other assets and the ability to project an effective projection of force are vital to the DO mission.

044-1.1.7 Other Missions – As a multi-mission capable asset, the RB-M may be required to conduct a wide range of other missions. These may include transporting specialized aids-to-navigation teams to verify aid locations, transferring specialized personnel to other vessels and structures, and serving as a platform for public relations activities.

044-1.2 The RB-M will normally operate with a minimum compliment of three – a coxswain, a qualified engineer and one crew member. However, certain missions require one additional special operations crew member. In these instances, the RB-M compliment will be four people.

044-1.3 The coxswain is the person responsible for the primary operation of the RB-M. The coxswain's responsibilities include steering, propulsion controls, course-keeping, and overall command of the RB-M. While the coxswain may be the one that drives the RB-M, the coxswain may also delegate this duty to one of the other crew members. For that reason, this Specification will refer to the person driving the RB-M as the helmsman.

044-1.4 The crew will assist the helmsman in safe navigation, operating the radios and electronic navigation equipment, and conducting all mission related activities.

044-1.5 The engineer is the person responsible for monitoring the condition of the propulsion machinery. The engineer makes routine inspections of machinery spaces while underway.

044-1.6 The RB-M special operations crew members may be required to man and operate machine guns mounted on the vessel. Operations involving the use of the machine gun frequently are

conducted while the RB-M is making way and could involve the RB-M approaching a target directly or at an angle.

044-1.7 Further information on standard Coast Guard boat operation practices is available in COMDTINST M16114.5B.

044-2 Survivability

044-2.1 As a multi-mission Coast Guard asset, the RB-M will be required to perform in a wide range of conditions. While every effort will be made to ensure the RB-M operates within its designated Mission Capable limits as shown in Figure 044-2, there will be times when the RB-M is forced outside these limits through the unpredictability of weather, rapidly changing sea conditions, hostile intent of others, system or component failures and human error. Thus, it is imperative that the RB-M provide a level of survivability beyond the required Mission Capable limits to ensure the safety of the crew. The following must be considered in the development of the RB-M:

044-2.1.1 Extreme Seas and Winds: The RB-M must have the capability to survive in extreme sea and wind conditions up to the Survivable limits shown in Figure 044-2.

044-2.1.2 Flooding and Damage Control: The RB-M must have the ability to survive flooding caused by component failure, hull damage or hostile fire. This includes an alarm system (see Section 436) and a bilge system to remove water (see Section 529), and ultimately enough reserve buoyancy, stability and compartment watertight integrity to withstand flooding of any single main compartment (see Section 079).

044-2.1.3 Fire: The RB-M must have the capability to detect and suppress onboard fires (see Section 436 and 555).

044-2.1.4 Back-up Systems: The RB-M must be provided with a means to maintain radio communication, provide limited navigation using GPS, provide emergency interior lighting, and maintain propulsion control for at least four hours in the event the primary electrical power generation system fails (see Section 313). In addition, the RB-M must be provided with a magnetic compass (see section 421) and an EPIRB (see Section 441).

044-2.1.5 Crew Egress: In the event of fire, capsize or other event that may cause the RB-M to be unsafe for its crew, it is vital that the crew be able to safely and rapidly get out of all internal compartments and be prepared to leave the RB-M.

044-2.1.6 Liferaft: If the RB-M is not self-righting, then a life raft or other similar device that can support the crew must be provided and located so that it can be rapidly deployed (see Section 583).

044-2.1.7 Shelter in Place: The RB-M must be capable of providing minimal “shelter in place” protection to protect the crew from hazardous operating environments. This includes watertight windows and doors (see Section 625) and the ability to seal off the ventilation system for limited amounts of time in emergency situations (see Section 512).

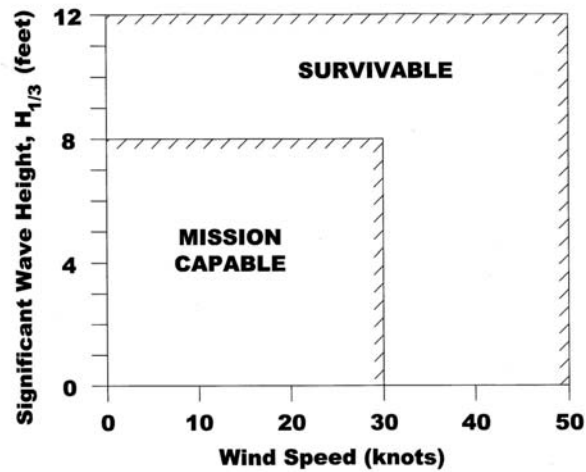


Figure 044-2 Sea State Limits

044-3 Areas of Operation

044-3.1 The RB-M will be expected to operate in the Coastal Zone of the United States and its territories, which includes inshore and inland waterways and open ocean out to 50 nautical miles from the coastline. The RB-M is not intended to be operated in the surf.

044-3.2 The RB-M will be expected to conduct missions up to the Mission Capable limits shown in Figure 044-2.

044-3.3 The RB-M will be expected to survive up to the Survivable limits shown in Figure 044-2.

044-4 Annual Hours of Operation and Mission Profile

044-4.1 The RB-M is anticipated to operate approximately 600 hours per year and may be stored uncovered in the water for the remainder of the time.

044-4.2 Operational Availability – The RB-M must have an average annual operational availability of at least 80%. Operational availability (A_o) is defined as:

$$A_o = \frac{\text{Operational Time}}{\text{Total Time}} = \frac{(T_o + T_s)}{(T_o + T_s + T_m + T_l + T_a)}$$

Where:

T_o	=	Operating Time (hours)
T_s	=	Standby Time (B – 0 status) (hours)
T_m	=	Maintenance Time (preventive and casualty) (hours)
T_l	=	Logistical Delay Time (hours)
T_a	=	Administrative Delay Time (hours)

044-4.3 On an annual basis, the mission profile is expected to be as shown in Table 044-4.

044-4.4 The mission profile is an average breakdown. Individual sorties may have considerably different percentages depending on the mission conducted. Individual sorties are typically restricted to 10 hours or less underway time.

Table 044-4 Mission Profile

Percentage of Mission	Speed Condition
15%	Towing
25%	Idle Speed
45%	Cruise Speed
15%	Top Speed

051 RB-M DESIGN REQUIREMENTS

051-1 Speed, Range and Endurance

051-1.1 The RB-M shall be capable of maintaining a top speed in the Normal Operating Condition of 40 knots (*threshold*), 45 knots (*objective*), in calm water in all temperature conditions stated in 070-4.

051-1.2 The RB-M shall be capable of maintaining a sustained (cruising) speed in the Normal Operating Condition of 30 knots in calm water.

051-1.3 The RB-M shall have a minimum range such that it can operate continuously for at least 250 nautical miles at 30 knots starting in the Full Load Condition with a 10% fuel reserve in calm water.

051-1.4 The RB-M shall have a maximum idle speed of 5 knots with both propulsion engines engaged in calm water.

051-2 Maneuvering and Seakeeping

051-2.1 The RB-M shall minimize the degradation of safe operating speed in increasing sea states.

051-2.2 The RB-M shall be safe and controllable at all speeds up to the maximum attainable speed and under all specified loading conditions (see Section 096). Safe and controllable operation shall constitute operation where craft orientation, motions and accelerations do not pose a hazard to the crew or passengers.

051-2.3 The RB-M shall be able to maintain a course heading in calm conditions, at all speeds and loadings, without significant corrective steering and shall be shown to have positive stability of route as demonstrated by the following test:

051-2.3.1 Means shall be provided for determining the rudder or steering device angle to a precision of five degrees or one sixth of the maximum steering device deflection. Any permanent means of reading the angle already installed may be used. Appropriate marks on the

steering wheel (or other device) may be used if the wheel has full follow-up positioning to the required precision. The vessel shall be put on a straight course and steered normally as required to maintain course. The angle shall be noted every five seconds for several minutes run at top speed, cruise speed and 1/3 power. The steering device deflection shall be divided into bands of five degree deflection, i.e. 35-30 degrees right, 30-25 degrees right, ... 30-35 degrees left and the number of deflections noted in each band shall be tabulated. Positive stability of route is indicated when a single band or two adjacent bands have the largest number of occurrences and all other bands have fewer such that each band has less than the one closer to those with the largest number. This is indicated visually by a single peaked histogram plot.

051-2.4 In turns at all speeds and loading conditions, the RB-M shall maintain a steady turn rate without skidding. Inboard heel shall be maintained throughout the turns. In coming out of a turn, the boat shall respond to the steering command without the need for excessive force.

051-2.5 The astern performance shall be such that the RB-M can be maneuvered in reverse at up to one-third power on a straight course and perform backing turns to port and starboard. No evidence of deck or cockpit flooding shall be evident under the conditions of this paragraph. Special platforms used for the recovery of people or material from the water are excluded from this requirement.

051-2.6 The RB-M shall be capable of performing emergency stops by decelerating from 40 knots to dead in the water in 12 seconds. In performing this stop, the propulsion system will be put into full reverse. The engine shall not stall or shut down at any time during the emergency stop maneuver.

051-3 Motion and Acceleration Limits

051-3.1 Unless otherwise specified, structure, equipment, machinery, and outfit shall sustain the accelerations of up to three gravities in the lateral (boat fixed) plane, four gravities in the vertical (boat fixed) plane, plus the motions provided in Table 051-3, without any failure or interruption of operation with the maximum extent of angle sustained for up to fifteen seconds.

Table 051-3 RB-M Motions

	<i>Threshold</i>	<i>Objective (Self Righting)</i>
Pitch	15 degrees	30 degrees
Roll	45 degrees	360 degrees

051-4 Towing

051-4.1 The RB-M shall be capable of towing a variety of craft (up to 50 long tons displacement (*threshold*), (100 long tons (*objective*)), astern and alongside, up to the mission capable limits shown in Figure 044-2.

070 GENERAL REQUIREMENTS FOR DESIGN AND CONSTRUCTION

070-1 Principle Characteristics

070-1.1 The RB-M shall meet the principal characteristics shown in Table 070-1.

Table 070-1 RB-M Principal Characteristics

Characteristic	Size
Length, Overall	45 ft overall (maximum)
Beam, Overall	14 ft overall (maximum)
Operational Draft – Full Load	4 ft 1 in (<i>threshold</i>) (maximum) 3 ft (<i>objective</i>) (maximum)
Navigational Clearance	13 ft 2 in appendages lowered (maximum) 26 ft 8 in appendages raised (maximum)
Height on Trailer	13 ft 6 in (maximum)
Weight in Hoisting Condition	40,000 lb (maximum)

070-1.2 Length – Length shall be measured from the forward most extremity to the after most extremity of the RB-M hull, fendering system, and appendages. When measuring length, the fendering system shall be fully deployed and ready for operation.

070-1.3 Beam – Beam shall be measured from the outer most extremities of the RB-M, including all appendages and fittings. When measuring beam, the fendering system shall be fully deployed and ready for operation.

070-1.4 Height on Trailer – Portions of the superstructure may be dismantled to meet this requirement.

070-1.5 Navigational Clearance – Clearance shall be measured from the static Minimum Operating Condition water line to the tallest vertical extremity when the appendages are lowered and raised. Navigational clearance shall be achievable underway in restricted waters. No more than two crewmembers shall be required to raise or lower the appendages.

070-1.6 When using dual sling lifts (Travel Lifts) the maximum weight per sling shall not exceed 20,000 pounds.

070-2 General Arrangements

070-2.1 The general arrangement of the vessel shall be suited to allow for performance of the intended missions as described in described in Section 044.

070-2.2 An enclosed pilot house shall be outfitted with four forward-facing seats for the helmsman and three crew members. The pilot house must allow for maximum lines of sight to allow the helmsman and crew to operate the RB-M from the pilot house. For the purposes of this specification the seats shall be designated for a helmsman, navigator, primary crewmember, and alternate crewmember

070-2.3 There must be interior space with seating for at least five passengers.

070-2.4 The RB-M shall have the ability to carry a casualty in a Stoke's litter inside while providing medical assistance. The Stoke's litter, when in use with a casualty, may take up to three passenger seats.

070-2.5 The RB-M must have sufficient deck space to conduct missions including helicopter recovery of a Stoke's litter, law enforcement and defense operations, transferring portable mission equipment such as the P-6 salvage pump, and handling persons recovered from the water. Deck space must be sufficient to allow easy passage around the RB-M, including passage alongside the pilot house when alongside a ship or bulkhead.

070-2.6 The RB-M shall provide the crew with the capability to reach down in the water and retrieve a person or object with no more than two crew required for the retrieval operation. The RB-M must provide for unassisted self-recovery of able-bodied crew members from the water.

070-2.7 The RB-M shall have weapons mounts to accommodate M60 light machine guns. Mounts shall be provided so that, with two guns, the crew will have maximum lines of fire around the perimeter of the RB-M.

070-2.8 The RB-M must have arrangements that are suitable for efficient towing operations astern and alongside.

070-2.9 The craft may have an alternate means of steering and propulsion system control at a location on the opposite side of the pilot house (*objective*).

070-2.10 The RB-M machinery and systems shall be capable of being easily reached for inspection, removal or maintenance without removal of permanent boat structure.

070-3 Service Life

070-3.1 The RB-M hull, deck and pilot house shall have a design service life of at least 20 years.

070-3.2 The fendering system shall have a service life of at least five years.

070-3.3 The propulsion system shall have a Mean Time Between Overhauls/Replacement of at least 3,600 hours.

070-4 Environmental Conditions

070-4.1 The RB-M and all of its equipment shall be capable of operating continuously in the following combined environmental conditions:

070-4.1.1 Temperatures – Outside Air (dry bulb): 100 degrees Fahrenheit to 0 degrees Fahrenheit.

070-4.1.2 Sea Water Temperature: 95 degrees Fahrenheit to 28 degrees Fahrenheit.

070-4.1.3 Visibility: The RB-M shall be fully capable of operations in fog, snow or heavy rain.

070-4.1.4 Surface Ice: All systems of the RB-M shall be capable of operating in slush ice. Strainers and through hull fittings shall not be clogged in slush ice conditions.

071 ACCESS

071-1 General

071-1.1 Access to compartments containing equipment, machinery or spare parts shall be provided to facilitate removal without disassembling the component. The access routes, size, quantity and location of removable patches shall be determined by the Contractor based on the installed equipment and the requirements of these Specifications. Access shall be arranged to be clear of piping, wireways, ducts and other obstructions. Fittings shall be provided along the equipment access routes to facilitate equipment removal.

071-1.2 Access shall be provided for engine removal. Fasteners, latches and/or hinges shall be flush to the deck to eliminate tripping hazards. Hatches shall be arranged to enable a direct vertical lift without disassembly of the engine. Hatches shall be designed so that they do not permanently distort and leak under operational conditions.

071-1.3 The RB-M shall have a sufficient number of accesses to provide for all routine inspections and damage control while underway. Main engine room access shall be provided through a quick acting watertight door or hatch. RB-M engineers make routine inspections of non-manned spaces while underway, with particular emphasis on machinery spaces. These inspections are conducted twice every hour.

071-1.4 Access shall be provided to bilge areas to ensure that bilges can be checked for water content and completely dewatered. Bilge access points shall provide access to the lowest point of the bilge when the RB-M rests in a level position.

071-1.5 Access to fuel tanks, hoses and fittings shall be provided.

071-1.6 All manned spaces shall contain two means of egress.

073 NOISE AND VIBRATION

073-1 General

073-1.1 Low noise levels are vitally important to mission effectiveness and long term crew health. The RB-M shall meet the noise level requirements shown in Table 073-1.

Table 073-1 RB-M Noise Levels

Noise Category	Maximum Level
Manned Spaces (top speed)	83.4 decibels (dBA)
Manned Spaces (cruise speed)	80.4 dBA
Exterior Deck (top speed)	90 dBA
Exterior Deck (idle operation)	84 dBA
Machinery Spaces (idle speed)	115 dBA

073-1.2 Reduced noise levels are highly desired (*objective*).

073-1.3 Far Field Noise – The noise level in the far field, external to the craft, should meet the sound level limit of 70 dBA measured when passing a fixed microphone positioned at a height not to exceed 10 feet above the water level with the craft transiting on a straight course at idle speed. The closest point of approach to the microphone shall be 100 ft in the upwind direction.

073-1.4 The boat and all boat components shall be free of local vibration that could damage the boat structure, machinery or systems, endanger boat personnel, or interfere with operation or maintenance of boat machinery and systems. No structure or component shall exhibit a natural frequency between 70% and 140% of driving vibrations of the propulsion system, including, but not limited to engine firing rate and propeller blade rate.

073-1.5 No component shall rattle. Mounts for removable components and accessories, including items moved for towing or transport, shall be provided with resilient material as necessary to prevent rattling. Gaskets shall be used and self-locking fasteners shall be provided to prevent loosening of fasteners under vibration.

073-1.6 Selection of resilient mountings and design of the mounting arrangement shall prevent excessive motion and unit damage under all boat motions. The mounts shall be fully captured to retain the mounted equipment.

074 WELDING

074-1 Code

074-1.1 All welding, brazing and related procedures, including joint design, joint strength calculations, edge preparation, fabrication, welding inspection and records, shall be in accordance with the standards set forth by the American Welding Society for the materials being welded and the intended service, except as specifically directed herein. Weld Procedures and welder's qualifications shall be in accordance with AWS B2.1, D1.1 and D1.2 welding standards.

074-1.2 All recommendations and information in AWS D3.7 shall be followed.

074-1.3 Welding Documentation. The Contractor shall maintain the following documentation and make it available for Government inspection upon request:

074-1.3.1 A list of Weld Procedure Specifications (WPS's) and associated revision dates.

074-1.3.2 Welder qualification documentation to include the last date the welder performed the indicated process.

074-1.3.3 Procedure Qualification Records (PQR's) and full WPS documentation.

074-2 Restrictions

074-2.1 Qualifying Welding Procedures. The Contractor shall qualify all welding procedures including those identified by AWS as "Prequalified Welding Procedure Specifications".

074-2.2 Process Restrictions. The Contractor shall not use gas metal-arc welding (GMAW) utilizing short circuiting arc transfer technique for welds in structure greater than 0.25-inch material thickness, unless the process and application are specifically approved by the

Contracting Officer. (The short circuiting arc transfer method is that in which a consumable electrode is deposited during repeated short circuits.)

074-2.3 Filler Material Restrictions. The Contractor shall be aware that low ductility shielded metal arc welding electrodes, including AWS classifications E6010, E6012, E6013, E7014 and E7024, as classified in AWS A5.1, are not approved for joints in critical welds.

074-3 Non Destructive Inspection and Testing

074-3.1 Inspector Qualifications. All individuals performing visual or Nondestructive Inspection (NDI)/Nondestructive Testing (NDT) operations shall be certified to one of the following requirements:

074-3.1.1 AWS Senior Certified Welding Inspector (SCWI) or Certified Welding Inspector (CWI) program.

074-3.1.2 ASNT Recommended Practice No. SNT-TC-1A, Qualification and Certification of NDT Personnel, as detailed by Table 1A, 1B, 1C or 1D. The inspector(s) shall be at a minimum certified to the ASNT Central Certification Program (ACCP) Level II certification.

074-3.2 Inspection Methods. Inspection of welded joints is to be performed by approved nondestructive test methods such as radiographic, ultrasonic, magnetic particle or liquid-penetrant inspection. Radiographic or ultrasonic inspection, or both, is to be used when overall soundness of the weld cross section is to be evaluated. Magnetic particle or liquid-penetrant inspection or other AWS Welding Inspection approved methods are to be used when investigating the outer surface of welds, or may be used as a check of intermediate weld passes. Inspections shall be in accordance with the following procedures:

074-3.2.1 Visual inspection (VT). Inspection shall be in accordance with AWS B1.11 or ABS Rules for Non-destructive Inspection of Hull Welds.

074-3.2.2 Liquid penetrant inspection (LPT or PT). Inspection shall be in accordance with ASTM E1417 and ASTM E165 or ABS Rules for Nondestructive Inspection of Hull Welds. No cracks are allowed.

074-3.2.3 Radiographic inspection (RT). Inspection shall be in accordance with ASTM E142 or ABS Rules for Nondestructive Inspection of Hull Welds.

074-3.3 Surface preparation for NDT. Inspection of completed welds shall be accomplished after slag removal and with the weld in the final surface condition. Power driven wire brushes shall not be used on surfaces that are to be liquid penetrant inspected unless the resulting surface is removed using an approved abrasive material prior to performing the inspection.

074-3.4 Weld examinations. The following welds shall be inspected:

074-3.4.1 All welds. All welds shall be visually inspected by NDI/NDT personnel or a qualified welder. Inspection prior to welding shall, at a minimum, include joint preparation, fit-up, and cleanliness.

074-3.4.2 Weight handling equipment welds. PT inspection shall be performed on all completed welds deposited with austenitic or nonferrous electrodes in weight-handling fittings or fixtures supporting over one ton, unless the fitting or fixture is proof load tested after installation.

074-3.4.3 Fillet welds 3/8 inch size and greater. The Contractor shall accomplish a surface examination, by appropriate nondestructive testing (NDT) methods, of fillet welds 3/8 inch size and greater.

074-3.5 Acceptance standards. The standards for acceptance of welding shall be in accordance with MIL-STD 2035, Class 3 acceptance standards for welds and NAVSEA 0900-LP-001-7000 for brazed joints. The Contractor shall repair all defects.

075 THREADED FASTENERS

075-1 General

075-1.1 All fasteners shall be of corrosion-resistant materials except for propulsion machinery foundations and mount fasteners where higher strength materials are appropriate. Fasteners provided with OEM equipment that are not corrosion resistant may be used in locations not exposed to the weather.

075-1.2 No fasteners shall be directly threaded into aluminum alloys. Helical coil inserts or pressed-in galvanically compatible threaded inserts shall be used when direct threading is required.

075-1.3 Direct attachment of alloys containing copper to aluminum is not permitted except for an electrical grounding strap.

075-1.4 Where nuts will become inaccessible after assembly of the RB-M, nuts shall be captured to allow re-assembly and prevent backing off. Unless otherwise specified, self-locking nuts of plastic insert type or all metal left-locking nuts of distorted type shall be provided to prevent loosening of bolts due to shock and vibration.

075-1.5 Fasteners in deck traffic areas shall be flush to eliminate tripping hazards.

076 RELIABILITY, MAINTAINABILITY AND AVAILABILITY

076-1 General

076-1.1 To maximize supportability, equipment models shall not be near the end of their production life.

077 SAFETY

077-1 Spray Shields and Protective Covers

077-1.1 Protective covers and shields shall be installed in accordance with Chapter 077, Section K, of COMDTINST M9000.6. Protective covers or shields shall also be provided on exposed rotating machinery.

077-1.2 Material Data Safety Sheets shall be provided (CDRL 077-01).

078 MATERIALS

078-1 General

078-1.1 This section specifies the minimum material standards and dissimilar metal restrictions. Material requirements stated in other sections of this Specification, which are in excess of the requirements of this section, shall have precedence over the requirements of this section.

078-1.2 Wherever more than one material is available to meet the requirements of the Specification, material providing reduced maintenance shall be used.

078-2 Materials

078-2.1 When materials are referred to in this Specification without further identification, they shall conform to the following materials, as applicable:

078-2.1.1 Aluminum

078-2.1.1.1 Tube ASTM B221 (Extruded) 5086-H111 or
5083-H112 ASTM B210 (Drawn) 5086-H32

078-2.1.1.2 Plate and Sheet ASTM B209 Alloy 5086- H112 or H116 or Alloy 5456-
H112 or H116 or 5083-H112 or H116

078-2.1.1.3 Shapes ASTM B221 (Extruded) Alloy 5086-H111 or H112 or 5083- H111 or H112 or Alloy 5456-H111 or H112

078-2.1.1.4 Alloy 5052 of SAE AMS-QQ-A-250/8 may be used for unwelded sheathing, expanded aluminum and trim for a thickness less than 1/8 in.

078-2.1.1.5 Alloy 6061-T6 of ASTM B241 may be used for pipes as structural components. If so used, allowable stresses shall be based on the zero tempered condition.

078-2.1.1.6 Non-structural items of trim and outfit such as window and doorframes, castings, and hardware items may be alloy 6063 or alloy 6061 of ASTM B221 or alloy 356.1, 356.2 or A356.2 of ASTM B179.

078-2.1.1.7 Copper bearing alloys shall not be used except in electrical wiring or internal to purchased components.

078-2.1.1.8 Aluminum of tempers H116 shall pass an appropriate test for resistance to exfoliation corrosion.

078-2.1.2 Stainless Steel

078-2.1.2.1 Wrought AISI 316L, AISI 302, or AISI 304

078-2.1.2.2 Pipe or Tubing ASTM A312, Grade 316L, 321 or 347

078-2.1.2.3 Wherever stainless steel, corrosion resistant steel or “CRES” is used or required it shall be as follows: Stainless steel 316L shall be used for welded fittings, couplings, etc. on the exterior of the vessel above and below the waterline of the hull that is exposed directly to sea water and for all applications on the weather decks unless stated elsewhere in this Specification. If stainless steel is used 316L shall also be used on all interior welded applications in sea water handling systems where direct exposure to sea water is possible. Stainless steel 316 shall be used in non-welded applications where direct contact with sea water or spray is possible. Use of 302 or 304 is restricted to interior, non-welded applications where exposure to sea water is not anticipated. For any portion of the exhaust system where temperatures over 750 degrees Fahrenheit may be encountered in any operational condition, including failure of any water flow, stainless steel grades 321 or 347 shall be used. For temperatures of 750 degrees Fahrenheit or below, 316L stainless steel shall be used.

078-3 Miscellaneous Requirements

078-3.1 Interior finish material and furnishings shall conform to fire performance requirements of MIL-STD-1623D (1) or 46 CFR 116.405 and 46 CFR 116.422 through 46 CFR 116.425.

078-3.2 Wood in any form shall not be used.

078-3.3 Materials that contain asbestos and refractory fiber materials (also termed ceramic fiber and aluminum-silica material) shall not be used.

078-4 Electrolytically Dissimilar Metals and Corrosion Protection

078-4.1 Direct contact of electrolytically dissimilar metals is not allowed. Electrolytic corrosion shall be prevented by insulating dissimilar materials from each other.

078-4.2 Direct contact between aluminum alloys and porous material, pockets, crevices and joints that can retain moisture is not allowed. Aluminum alloy surfaces intended for contact with porous material shall be coated. Joints and crevices shall be sealed with caulking compound. Pockets too large to be caulked shall be coated.

078-4.3 Lead graphite pencils shall not be used to mark uncoated aluminum. Grease pencils and other possible sources of hydrogen contamination shall not be used on aluminum prior to welding.

078-5 Toxic Products and Safety

078-5.1 Paint, insulation, adhesives or other items containing materials or components that would give off noxious fumes at any temperature below 203 degrees Fahrenheit shall not be installed or applied on hull structural materials. For paints and adhesives, this requirement applies after drying or curing is complete. In accordance with COMDTINST 6260.30, coatings and materials containing free isocyanates shall not be used.

078-6 Mercury Exclusion

078-6.1 Mercury, either undiluted or in solution in as small a portion as one part per million, will cause severe corrosion to aluminum. In order to protect the craft from contamination, the

Contractor shall restrict the use of equipment containing functional mercury during construction. The Contractor shall restrict the use of equipment containing functional mercury installed onboard the craft to items such as mercury batteries contained in electrical test instruments and permanently installed instruments, sensors and controls required by this Specification.

078-6.2 Functional mercury in equipment shall be potted, or otherwise sealed, and the sealed unit contained within a secondary barrier to prevent contamination of the aluminum in case of rupture of the sealed unit.

078-6.3 Functional mercury is mercury or mercury compounds required for proper operation of a component or, without the presence of which, the component would fail to operate properly.

079 STABILITY AND SEAKEEPING

079-1 Stability Analysis

079-1.1 The Contractor shall perform all calculations and prepare all documentation to demonstrate the vessel is in accordance with the stability requirements described in this section. (CDRL 079-001)

079-1.2 Government Weight Margin: 600 lbs

079-2 Intact and Damage Stability

079-2.1 The boat shall meet the intact stability criteria of 46 CFR 28.565 through 46 CFR 28.575. Note that an explanation of these rules may be found in NVIC 5-86 except that the definition of L_{w1} and L_{w2} in the NVIC are changed to a single value of L_w in 46 CFR; $L_w = 0.00216 \sum_n (V_n^2 A_n Z_n) / W$.

079-2.2 The boat shall meet the unintentional flooding criteria of 46 CFR 28.580 except that 46 CFR 28.580(b)(4) and 46 CFR 28.580(h) to the end shall not be applicable and 46 CFR 28.580(d)(1) shall read “Longitudinal extent – L/10. Transverse watertight ...” Fendering shall not be considered for damage survival.

079-2.3 The intact and damage stability criteria shall be achieved in all conditions of fuel and other variable liquid loads. Variable liquid ballast, including ballast to compensate for burned fuel or other consumed liquids, shall not be used to achieve these criteria in any load condition.

079-3 Trim and List Limits

079-3.1 The RBM shall not trim down by the bow or list more than one half degree in the static condition in the Full Load or Minimum Operating Conditions. Ballast shall not be allowed to achieve this requirement.

079-3.2 The RB-M shall not heel more than one half degree at any speed when running in calm conditions.

079-4 Self-Righting Stability (*objective*)

079-4.1 The RB-M shall be self-righting. Self-righting may be provided either inherently through the design and configuration of the RB-M, actively through the use of deployable floatation devices or other means, or a combination of methods.

079-4.2 Self-righting is defined as having positive righting arms at all angles of heel except 0 degrees and approximately 180 degrees. Self-righting is required for all load conditions identified in 096.

079-4.3 The time to self-right from the fully inverted position to the upright shall not exceed 30 seconds.

084 TRANSPORTATION, SHIPPING, AND STORAGE OF VESSEL**084-1 General**

084-1.1 The RB-M shall be prepared for delivery in a manner which shall assure and provide protection against damage and which shall assure safe delivery of the boat at its destination.

084-2 Preparation for Delivery

084-2.1 Unless otherwise specified, boat and equipment disassembly shall be the minimum necessary to make accessible for cleaning, drying and preservation of installed systems, equipment and critical surfaces. Removal of accessories such as masts, antennas, cabin top, or other attached or demountable equipment which can create a boat transportability problem, or facilitate protection of the boat, equipment or item from damage or pilferage, shall be permitted where such removal will not affect permanent settings or alignments, and where the removed items can be readily reassembled at the installation site without the need for special tools or gages. Removed hardware (bolts, nuts, pins, screws, washers, and others) shall be reinstalled in the mating parts and secured to prevent their loss. Removed items or parts, other than hardware, shall be packaged as required for delivery of the boat.

084-2.2 Removed items, except hardware, shall be match marked to facilitate reassembly. Removed items shall be tagged, marked and the tags attached to each mating item. The tags and printing therein shall be resistant to oil, water, and fading.

084-2.3 Items, accessories, spare and repair parts, and tools removed from their operating locations and manuals packed as specified herein shall be stowed in their designated stowage location. Material stowed above and below decks shall be secured preventing material movement, dislodgement and damage to the material, stowage facility and boat or craft during its handling, shipment, and storage.

084-2.4 The bilges shall be completely drained, cleaned and dried.. The exterior of the boat shall be completely washed down with fresh water. Sea water systems and waterjets (if installed) shall be flushed with fresh water.

084-2.5 The batteries shall be disconnected. Terminals and leads shall be tagged indicating terminal and lead polarity. Disconnected cables shall be secured to prevent damage to the cables and batteries.

084-2.6 Fuel tanks shall be shipped dry.

084-2.7 Fixed extinguishing systems shall be fully charged, mountings tight and secure, and cylinder valves closed or actuator heads removed. Portable extinguishers shall have their triggering devices secured to prevent activation.

084-2.8 The boat shall be provided with a flexible or rigid cover (e.g., shrink wrap, canvas, or flexible reinforced plastic) to protect the boat from deterioration or damage during shipment. The covers shall be secured to prevent loosening, detaching, and loss or becoming a safety hazard during shipment.

084-3 Repair of Damage Incurred During Shipping

084-3.1 Any damage to the RB-M during shipping shall be repaired by the Contractor prior to acceptance.

084-3.2 Painted surfaces on which the paint is damaged or defective shall be cleaned and repainted with the original specified paint of the same quality, color, and paint system as originally supplied.

085 DRAWINGS

085-1 General

085-1.1 The Contractor shall provide drawings as necessary for use, repair, modification and maintenance of the boat. (CDRL 085-001). These drawings shall depict the boat in a manner so as to make the functionality of systems easily evident and shall depict all components of the boat including but not limited to:

085-1.1.1 Boat Drawing Index.

085-1.1.2 General Arrangements showing equipment, machinery, outfit and joinery.

085-1.1.3 Hull molded shape with tables of offsets and other dimensions required to fully define the hull geometry (i.e. hull lines or equivalent).

085-1.1.4 Dimensioned arrangements of machinery including shafting, exhaust and steering gear.

085-1.1.5 Molded shape of any pilot houses, deck lockers, etc.

085-1.1.6 Structural components of the hull, superstructure, pilot house and any lockers or other components including all plating; supporting structure, such as longitudinals, transverses, and engine girders; bulkheads, and decks, foundations, and brackets. These drawings shall include welding symbols.

085-1.1.7 Schematics and arrangements of piping, Heating, Ventilation and Air Conditioning (HVAC) and mechanical systems and their components including unique parts. Arrangements of piping and other components may depict a single system completely or all systems in a major space at the Contractor's option.

085-1.1.8 One-line electrical diagram.

085-1.1.9 Electrical and electronic schematics and arrangements.

085-1.1.10 Drawings depicting unique electrical components (such as switchboards) and their internal connections.

085-1.2 Drawings shall include all information necessary to reproduce any part unique to the boat or otherwise not generally commercially available, including, but not limited, to propulsion shafts, struts, rudders and similar special components.

085-1.3 All drawings shall be in AutoCADTM Release 14 or 2000/2002 in both “dwg” and “dwf” format. Any compiled shape files, including SHX’s”, “ReboidsTM”, other proxies or other special features not distributed with standard AutoCADTM shall be supplied, royalty-free, to the Coast Guard.

085-1.4 Bills of Materials shall be provided with the drawings. They may be incorporated in each drawing or may be a separate drawing.

085-1.5 The Contractor is encouraged to follow the Extended Ship Work Breakdown Structure (ESWBS) scheme in organization of drawings, but may propose a different system if it enhances the comprehensibility of the drawing set.

086 TECHNICAL PUBLICATIONS

086-1 General

086-1.1 The Contractor shall provide Technical Publications that provide a physical and functional description of the craft, its machinery, and equipment.

086-2 General Information Book (GIB)

086-2.1 The Contractor shall prepare the General Information Book (GIB) (CDRL 086-001) in accordance with ABYC Project T-24, excluding sections C and D. The GIB shall contain basic information concerning the capacities, characteristics, capabilities and operation of the boat, its systems, and its equipment. The GIB shall include an equipment list that reflects the final equipment configuration for the system and includes the model and/or type number. The information shall be given in sufficient detail to provide indoctrination and training on the boat and to promote an understanding of the system interfaces and interactions, and circuits of control. System diagrams shall be included with the written description to provide more accurate information on the boat. To avoid duplication, detailed information and instructions provided elsewhere under equipment manuals and systems operating manuals shall be referenced, but not included, in the GIB.

086-2.1.1 References to drawings shall be by title and drawing number. References to technical publications or manuals shall be by title. Diagrams and illustrations shall be included throughout for purposes of graphically illustrating systems.

086-2.1.2 The GIB shall provide the Government with a Master Equipment List (MEL). The MEL shall include the manufacturer, model/size, and quantity of all items required to satisfy the contract specification requirements. Wire and cable, individual fasteners, and fabricated items (such as hull structural members) do not need to be itemized.

086-2.1.3 The GIB shall provide the Government with a machinery removal instruction/ diagram for equipment which cannot be carried out through the provided hatches by one person. The instruction/diagram shall identify the location of patches and requirements for rigging including lifting spreaders, slings, shackles, etc.

086-2.1.4 The GIB shall provide a single 8-1/2 x 11 sheet Stability and Loading Instruction, suitable for insertion in a three-ring manual or posting at the control station, providing information on navigational clearance and operational draft and the effect of weight changes on these characteristics. The instruction may also show sling points, location of underwater equipment, or other information at the Contractor's option. The Contractor shall perform the calculations necessary to produce this instruction.

086-3 Equipment Operation and Technical Manuals

086-3.1 Standard, unmodified manufacturer equipment operation and technical manuals shall be provided for all equipment. (CDRL 086-002) Manuals shall be sorted by ESWBS category.

088 HUMAN FACTORS

088-1 General

088-1.1 In accordance with ASTM F1166-95a(2000), the boat shall be constructed to accommodate the 5th percentile adult female to the 95th percentile adult male in Coast Guard personal protective equipment including insulated flotation coveralls, survival vests, gloves, boots, side arms, and helmets. Human engineering factors considered in design shall include ergonomics, accessibility, visibility, readability, crew efficiency, safety and comfort.

092 TRIALS AND TESTING

092-1 General

092-1.1 The Contractor shall conduct all test and trials to verify that the RB-M meets the requirements stated herein and document the results. The results shall be submitted in the Trials and Testing Report. (CDRL 092-001).

096 WEIGHT AND LOAD CONDITIONS

096-1 Weight Reports

096-1.1 Final Weight Report (CDRL 096-001).

096-1.1.1 The final weight of the RB-M shall be determined prior to Builder's Trials. No margins shall be included in this weight report except for the government service margin and that a positive or negative adjustment shall be made based on the inclining experiment data.

096-2 Weight Report Requirements

096-2.1 Weight reports shall be formatted in accordance with ESWBS.

096-2.2 Weights shall be referenced to the arrangement drawings, system diagrams, and other drawings prepared in accordance with the Contract. Every item over 2 lbs shall be listed separately. Items such as insulation, paint, deck covering, etc., may be listed as a single entry.

096-2.3 Weight reports shall provide the displacement and center of gravity location for the Light Condition, the Hoisting Condition, the Minimum Operating Condition, the Normal Operating Condition, the Full Load Condition and the Full Load with Cargo Condition. In addition, the weight reports shall include the draft and trim for each condition.

096-2.4 Weights may be obtained either from suppliers, by calculation from working drawings, by weighing items, or by a combination of the above. The weights of piping, insulation, structural components, etc. may be calculated. These items shall be weighed on a selective or sampling basis, as determined by the Contractor, to establish the accuracy of calculated weights. Where factors or percentages are utilized for calculating paint, welding weights, etc., the Contractor shall be prepared to substantiate values with background information.

097 INCLINING AND SELF-RIGHTING TESTS**097-1 Scope**

097-1.1 The Contractor shall perform inclining tests afloat, and a scale weighing / incline test with the RB-M suspended in air. If the RB-M is self-righting the Contractor shall perform a self-righting test.

097-2 Inclining Tests

097-2.1 The Contractor shall prepare an Inclining Plan for both the afloat and scale weighing / incline test with the RB-M suspended in air which describes the procedure to be followed. (CDRL 097-001) This report shall include, but not be limited to, the information specified in COMDTINST M9000.6 Chapter 097 and Appendix A.

097-2.1.1 All references to Commandant Representative, NESU Representative, CO/OIC, ELC(02), or ELC(023) shall read “Contracting Officer”.

097-2.1.2 All references to Stability Test Officer shall read “Contractor”.

097-2.1.3 Load conditions listed for inclusion in the test report shall be in accordance with Section 096 of this Specification.

097-2.1.4 Section B of COMDTINST M9000.6 Chapter 097 is not applicable.

097-2.1.5 Paragraph 1 of Section E of COMDTINST M9000.6 Chapter 097 should read “Appendix A” instead of “Appendix 1.”

097-2.2 The Contractor shall perform the inclining experiment in accordance with procedures outlined in COMDTINST M9000.6 Chapter 097 and Appendix A, except as modified in this section.

097-2.3 This scale weighing / incline test shall comprise the following steps or shall be conducted in a similar manner that will provide comparable accuracy in determining the craft weight and center of gravity:

097-2.3.1 Suspend the craft from two slings fore and aft, one near the bow and one near the stern. Each sling shall be bent on to a common point comprising a shackle, round link or pear link over the centerline of the craft. The slings shall be vertical. The craft shall have the keel level to within 2 degrees. Weighing may be accomplished with two scales, one on each sling, or by use of a single scale and a link of the same length which are interchanged. (Note that the craft must not change attitude if the scale and link are interchanged.) The scale(s) shall be certified legal for trade and shall have a precision better than, or equal to, fifty pounds. The fore and aft and vertical location of the suspension points (the surfaces of the shackle bearing on the member supporting them from above) shall be carefully determined to within one inch relative to a clearly defined point on the craft and shall be level to within one inch of each other. The sum of the readings gives the total weight of the craft, their difference and their location gives the LCG. A weight shall then be applied a known distance off-center to one side and the angle of heel measured. Additional weight approximately equal to the initial weight shall be applied to the same point and the angle of heel shall be measured again. The weight shall then be removed, the angle of heel measured again and placed in a similar sequence on the opposite side, measuring the resultant angles of heel. The location and amount of weight, the vertical location of the suspension points, and the total weight of the craft gives the vertical center of gravity. The angle of heel shall be measured by two independent means which do not require persons on or under the craft and which give equivalent precision to 1/8 inch of deflection on an eight foot pendulum (approximately 0.1% slope). Such means may include tracking of points with a transit, digital levels, water levels, or other means proposed by the Contractor. The means of measuring the angles shall be verified to the required precision by means to be proposed by the Contractor. For more information on air inclining see Principles of Naval Architecture, Volume I, p126.

097-2.4 All inclining weights, scales, equipment for observations, cribbing and other material required for the experiments shall be furnished by the Contractor. The Contractor shall also provide all labor necessary for preparing the boat for inclining, installing apparatus, taking measurements and observations, handling lines and shifting incline weights during the experiment.

097-2.5 The Contractor shall prepare an Inclining Test Report presenting the description and results of both tests. (CDRL 097-002) The afloat incline test report portion shall include measurements of appendage draft from the calculated Full Load Condition waterline to the bottom of the lowest point in the same vertical plane and shall include a calculation of the roll period constant for each load condition. The scale weighing / incline test report portion shall be in Contractor's format. The report shall include for each test an error analysis determining the 95% confidence level accuracy of the data for displacement, moment-tangent slope, and the resultant KG, and a comparison of the results of the two tests.

097-3 Self-Righting Tests

097-3.1 If a self-righting boat is offered, the Contractor shall conduct a 360-degree self-righting test on a fully outfitted craft to verify the self-righting capability. If active devices are required to self-right an intact craft, the required self-righting devices shall be demonstrated in an actual

self-righting test, and actuators and sensors also shall be shown to function properly in each intended mode of activation.

097-3.1.1 The Contractor shall submit a Self-Righting Plan (CDRL 097-003). This report shall include, but is not limited to, a description of the mooring for the test, a description of the point load application and sling placement, safety procedures and craft loading, device tests, actuator and sensor tests, and the intended result of each test.

097-3.2 The craft shall be tested in the Full Load Condition. The weight of the crew members and the passengers is to be simulated in their respective seats. Equipment that might be damaged during the test may be replaced with objects with the same weight, volume and center of gravity. The overturning moment shall be applied in the horizontal direction and approximately amidships to limit displacement and trim changes during the test.

097-3.2.1 The Contractor shall submit a Self-Righting Test Report (CDRL 097-004) which includes a video of the test. The report shall include loading condition summaries for all conditions as defined.

SECTION 1: STRUCTURE

100 STRUCTURE

100-1 General

100-1.1 The hull and pilot house structure and scantlings shall be fully compliant to a well-recognized standard for the type of service which is appropriate for the RB-M. Three such commonly used standards are NVIC 11-80, ABS and DNV, but the Contractor may propose other standards based on his previously proven practice. The Contractor shall prepare all calculations and analyses necessary to demonstrate the adequacy of the structural design (CDRL 100-001).

100-1.2 The vessel hull, main deck and pilot house structure shall be aluminum.

100-2 Details of Construction

100-2.1 Plate inserts shall have corner radii no less than shown in the following table.

Table 100-1 Plate Insert Corner Radii

Plate Insert Min. Dimension	< 4 inches	4-20 inches	> 20 inches
Plate Corner Radii	$\frac{\text{Min Dim}}{2}$	2 inches	$\frac{\text{Min Dim}}{10}$

100-2.2 Where intercostal members are fitted, misalignment shall be limited to one-half the thickness of the web of the intercostal member. Where there are webs of different thickness, the thinner web shall be used to determine the allowable misalignment.

100-2.3 Where possible, beam and column ends shall land on other structural framing members. If not possible, beam-ends shall be modified to prevent puncturing of the plating by end rotation. This shall be accomplished by installation of headers or brackets spanning to adjacent structure.

100-2.4 Structure and fittings in way of propulsion and auxiliary machinery shall be arranged to provide clearance for disassembling parts and components without dismantling other machinery, structure or piping.

100-2.5 Butts shall not cross seams.

100-2.6 Doors, arches, and other openings shall be located such that a minimum number of stiffeners are cut and the efficiency of the bulkhead as a strength member is not impaired.

100-2.7 Where a structural bulkhead, pilot house side, or other substantial structure crosses a structural bulkhead, web frame, or deep girder on the opposite side of the plating, forming a knife-edge support, chocks, headers or other means shall be fitted to the opposite side member in the plane of the crossing structure so as to distribute the load.

100-2.8 Stanchions, if provided, shall be aligned with the webs of the supporting structure in the longitudinal and transverse planes.

100-2.9 Attachment of components to structural members shall not reduce the strength of the member unless the member has been specifically sized for such purpose. Brackets, margin plates, doubler plates, inserts, or special framing may be attached to the structure and used for mounting components. Drilling or tapping flanges of structural members shall not be done unless the members were sized with due consideration for such drilling or tapping.

100-3 Holes in Structure

100-3.1 Circular holes may be used either to reduce the weight of the structure or to provide access, provided the required strength and rigidity characteristics are met. Where the geometry of the structure precludes the use of a circular opening, other hole shapes may be used, however corners shall be rounded to radii of at least one-fourth of the clear dimension normal to the direction of principal stress. If the size or location of an opening impairs the strength of the structural member, the member shall be reinforced. All exposed plate edges shall be smooth to prevent personnel injury.

100-3.2 Holes shall be spaced so that the distances between edges of adjacent holes will not be less than 1-1/4 times the diameter or the length of the holes. If adjacent holes are of different lengths, the minimum space between them shall be not less than 1-1/4 times the average of their two lengths.

100-4 Limber Holes

100-4.1 Limber holes shall be provided in longitudinal and transverse members for bilge drainage and to prevent the accumulation and retention of liquids and to permit their free flow to drains, scuppers, sumps and suction pipes. Limber holes in bottom longitudinals and keelsons shall be located to ensure draining of each bay formed by longitudinals and transverse frames. The number and size of limber holes may be reduced by including the area of scallops and cutouts for shell seams and butts where they are available for drainage.

100-4.2 Limber holes in the bottom area or in other areas where water may collect shall be welded all around to seal faying surfaces.

100-4.3 Tanks fitted with fill and drain arrangements shall be provided with air holes to prevent the formation of air or gas pockets and to provide clear passage to air escape vent pipes.

100-4.4 Longitudinals, girders, and transverse structural members forming the boundary beneath the propulsion engines and reserve/reduction gears shall not be fitted with limber holes in order to limit oil leakages into the bilge area. A pipe plug shall be fitted at the low point of the closed area to permit draining.

100-5 Fairness

100-5.1 Fairness shall be in accordance with NAVSEA 0900-LP-060-4010, Change 2, dated 17 March 1980, Figures 12-6 and 12-7 except that in Figure 12-7 the allowable deviation shall be halved. Figure 12-6 shall apply to structural bulkheads, walking flats, and tank bulkheads, and the Figure 12-7 shall apply to shell, main deck, superstructure and enclosures.

100-5.2 Filling compound or flame straightening shall not be used to compensate for unfairness in the boat structure. Methods using other techniques for application of heat alone, such as laser fairing, may be considered, but the Government does not guarantee that it will accept any method proposed. Weld beads may be applied to the center of panels or alongside stiffeners to reduce unfairness. All beads of such welds shall be ground off.

100-5.3 "Panting" or "oil-canning" is not permitted.

100-6 Construction Tolerances

100-6.1 Cumulative departure from the hull lines shall be held within the following limits:

100-6.1.1 Plus or minus 1 inch overall length of the hull.

100-6.1.2 Plus or minus ½ inch in overall beam.

100-6.1.3 Plus or minus ½ inch in depth of the hull.

102 TIGHTNESS

102-1 General

102-1.1 The hull, weather decks and pilot house shall be watertight.

102-1.2 Boundaries of tanks shall be watertight or oil-tight as appropriate.

102-1.3 Deck and bulkhead closures shall conform to the tightness of the deck or bulkhead on which they are installed.

102-1.4 Consoles shall be weathertight.

102-1.5 Gunning material, caulking-type material, peening, paint etc. shall not be used to meet tightness requirements.

102-1.6 Stuffing tubes, flanged joints, or stuffing boxes shall be provided to maintain the required tightness of the bulkheads and decks.

102-1.7 Corrosion-resistant recessed threaded pipe plugs utilizing threaded inserts shall be installed in the top and bottom of inaccessible voids to allow for air testing and drainage.

110 SHELL AND SUPPORTING STRUCTURE

110-1 General

110-1.1 The keel, keelsons, girders, propulsion engine/reduction gear foundations, bottom longitudinals, and side longitudinals shall be continuous through transverse structures. Collars or flat bar inserts shall be fitted around structure passing through watertight and oil-tight bulkheads. Abrupt changes in section are to be avoided.

110-1.2 Thickness differences between connecting plates of more than 1/8 inch shall be tapered off 4 to 1.

110-1.3 Tee joints at boundary connections of decks shall have continuous welding on both sides.

110-1.4 The structural members within the hull bottom, or in other areas where water may collect, shall have double continuous welds. This shall include keel, keelsons, girders, propulsion engine, and reduction gear foundations to shell plating. Longitudinals, transverses and other main support structure below the main chine or spray rail, engine girders, and similar structure loaded by vibration or sea impact shall be continuously welded, except that flanges of longitudinals comprised of angles, tees or bulbs shall not be welded to frames.

110-1.5 Adequate shear area shall be provided on all welds between longitudinals and their supporting structure. The webs of the bottom, side and deck longitudinals shall be connected to the transverse web frames to transfer the shear loads. Clips may be used on either one side or both sides of the web as required.

110-1.6 Full penetration welds shall be provided for butts and seams of the keel, bottom shell, side shell, main deck, and transom. Welded joints in the keel, keelsons, girders, propulsion engine/reduction gear foundations, and bottom longitudinals shall be full penetration welds at the webs as well as the flanges (except that flanges in longitudinals shall not be attached to transverses).

110-1.7 Butt joints in the longitudinals shall be at least 6 inches from transverse frames and 6 inches from plating seams.

110-1.8 Interference of plating butts and seams with weld traces of structural members that attach to plating shall not be permitted. Butts shall be at least 3 inches, but no more than 12 inches from the transverse structure. Seams shall be at least 3 inches from longitudinal elements of the structure.

114 FENDERING SYSTEM

114-1 General

114-1.1 The RB-M shall be outfitted with a prominent, fixed fendering system that will protect the hull from collisions without damage during the boarding and alongside towing missions as described in Section 044. The fendering shall in no way damage, mar or otherwise affect the craft to be boarded.

114-1.2 The fendering system shall extend around the complete perimeter of the boat except the transom.

114-1.3 Non-inflatable fendering systems shall be modular to allow for ease of replacement and replacement of only those sections that are damaged. The fendering shall be interchangeable so that custom fitting of spare fendering is not required.

114-1.4 Inflatable fendering shall have individual chambers which shall not exceed 20% of the total fendering volume. All inflatable chambers shall be fitted with over-pressurization relief valves.

114-1.5 The fendering color shall be International Orange. An alternate fendering color may be approved by the Contracting Officer if International Orange is not available in the fendering material selected. Heavy duty rub strakes, non-skid or other fittings on the fendering do not need to be International Orange.

114-2 Removal and Replacement

114-2.1 The fendering shall be attached to the hull in such a manner that it can be removed for repair or replacement.

114-3 Fender Materials

114-3.1 The fendering shall be constructed of durable materials which are highly resistant to puncture, tearing, and sunlight degradation.

114-3.2 Materials used for fendering systems shall be suited for the intended use without noticeable moisture absorption, deterioration of performance characteristics, or increase in weight over time.

114-4 Air Inflation System

114-4.1 If air is required for fendering inflation, an air pump and inflation valves shall be provided.

120 STRUCTURAL BULKHEADS

120-1 General

120-1.1 Full penetration welds shall be provided for butts and seams of the bulkheads and tanks. Tee joints at boundary connections of bulkheads and tanks shall have continuous welding on both sides.

120-1.2 All attachments of bulkhead stiffeners to plating, up to chine and for one-tenth of their length at the opposite end, shall be made by double continuous fillet welds. The nominal leg of the welds shall be 1/16 inch less than the thinner plate attached, but shall not be less than 1/8 inch.

120-1.3 Where wiring trunks, pipe tunnels, or shaft tubes terminate in transverse watertight bulkheads, the ends of such trunks or tunnels shall be sealed watertight at each such bulkhead. Stuffing tubes, flanged joints, or stuffing boxes shall be provided as necessary to maintain the tightness of the bulkhead and deck.

120-1.4 Attachments to bulkheads for the purpose of supporting local loads shall not impair the strength or tightness of the bulkhead. Insert and margin plates, additional reinforcing, special framing, or stiffening shall be installed to distribute local stress. Attachments shall be made to the framing and not directly to the bulkhead plating.

123 TANKS

123-1 General

123-1.1 Fuel tank fill and vent piping shall be sized and located such that:

123-1.1.1 Water contamination of the fuel during fueling is avoided.

123-1.1.2 Spills will not enter the boat.

123-1.1.3 No tripping hazard is created.

123-1.1.4 Filling can easily be accomplished from the deck.

123-1.1.5 Small fuel spills at the filler are contained prior to escaping overboard and contaminating the water.

123-1.2 Fuel tanks shall be equipped with an access allowing removal of the fuel level sensing unit.

123-1.3 Fuel tanks, if non-integral, must be removable without the cutting of hull/deck structure.

123-1.4 Non-integral tanks shall comply with 46 CFR 182.435 – 182.450 except that 46 CFR 182.440(d) shall be forbidden.

123-1.5 Integral fuel tanks must provide access for inspection to all portions of the tank.

123-1.6 All boundaries of integral tanks shall be designed to the same pressure as the bottom of the boat.

123-1.7 All structure members on tank boundaries and swash plates shall have continuity to structure bounding the tanks to minimize structural hard spots causing cracking.

130 DECKS

130-1 General

130-1.1 The girders and deck longitudinals shall be continuous through transverse structures. Collars or flat bar inserts shall be fitted around structure passing through watertight and oil-tight bulkheads.

130-1.2 Decks shall be reinforced in way of equipment or components placing point loads on the structure, hatch corners, and any other interruptions of the continuous deck. All deck openings shall have well rounded corners and shall be reinforced with insert plates or coamings.

130-1.3 Attachments of deck girders and stiffeners to plating shall be made by welding. Plug or slot welding may be allowed for the connection stiffeners made of rectangular or square hollow tubing, channels, or other shapes offering a wide faying surface against the plate.

150 PILOT HOUSE STRUCTURE

150-1 General

150-1.1 The lower ends of vertical pilot house stiffeners shall be either continuous with hull or deck framing or shall be provided with suitable reinforcement structure on the hull in accordance with Section 100.

167 DOORS, HATCHES, SCUTTLES AND MANHOLES

167-1 General

167-1.1 All watertight doors and scuttles shall be quick acting.

167-1.2 Doors, hatches and scuttles throughout the craft shall have bumpers or other devices installed to protect equipment and light structure, and hooks or other means to retain hinged doors, hatches and scuttles in the fully opened position.

167-1.3 Primary hatches or scuttles where routine or emergency access is required shall be swinging type, requiring no additional tools to open or close. Doors or hatches opening to manned spaces and one opening provided to access the machinery space shall require no additional tools to open or close. All doors, hatches and scuttles shall have handles on both sides.

167-1.4 Primary doors or hatches opening to manned spaces shall be provided with a fire-resistant portlight. A fire-resistant portlight allowing visibility of the machinery from either the deck or a manned space shall be provided as well, but need not be in a door or hatch.

167-1.5 Water sheds shall be fitted over all doors and ports opening to the weather.

167-1.6 Manholes shall be provided for access to all compartments, tanks, cofferdams, voids and pockets which are not provided with other means of access.

167-1.7 Compartments with fire suppression systems shall be equipped with accesses that open outward to allow emergency egress.

167-1.8 All hatches on the main deck or in a walking surface shall be of the flush type.

167-1.9 Minimum clear opening dimensions of hatches shall be not less than 15 inches by 23 inches or circular 22 inches. All main deck hatches shall open as required to facilitate egress and ingress, to minimize interference with equipment or operations on deck, and to minimize the possibility of boarding waves to open a partially closed hatch.

170 MASTS AND ARCHES

170-1 General

170-1.1 A means shall be provided to fly two 12" x 18" ensigns (flags), one over the other. The ensigns shall not interfere with any electronics or lights.

170-1.2 Fittings and foundations shall be constructed to prevent tearing of ensigns or rigging.

170-1.3 Fittings and equipment shall be accessible for maintenance.

170-1.4 Masts and arches shall be watertight or provide means of free drainage.

170-1.5 Masts and arches shall be unstayed. The mast shall not be capable of excitation from synchronous boat motions, propeller frequency and/or wind induced excitation.

180 FOUNDATIONS AND BRACKETS

180-1 General

180-1.1 Strength and rigidity of foundations shall be suitable to withstand all the design loads and distribute such loads into the structure.

180-1.2 Foundations subject to cyclically repeated or reversed loadings shall be designed to withstand fatigue.

180-1.3 Foundations shall contain no pockets which can retain liquids, except the main engine foundations shall contain a catch area to prevent leakage of lubricating and fuel oil into the bilges. A removable plug shall be fitted in lieu of drain holes. The plug shall be accessible and shall be located at the lowest practicable drain point. The Contractor may use a Fast Lube Oil Change System (FLOCS) connection here. (See 233-3)

180-1.4 Foundations shall be arranged to provide sufficient clearance for servicing and disassembling parts such as circulating pumps, air coolers, pistons, stators, valves and rotors without dismantling other machinery, structure or piping.

180-1.5 All foundations shall be designed and constructed so that positive and accurate alignment of equipment and components can be maintained.

180-1.6 The rigidity of foundations and supporting structure shall be sufficient to prevent misalignment which would interfere with operation of the machinery and equipment and to preclude excessive vibratory motion or rocking on the foundation.

180-1.7 All equipment exposed to weather shall be fastened to its foundation with stainless steel studs or bolts, and nuts and washers. Installations requiring fasteners not made of stainless steel shall be submitted to the Contracting Officer for approval.

SECTION 2: PROPULSION

200 PROPULSION PLANT

200-1 General Requirements

200-1.1 The propulsion system shall consist of twin marine diesel engines and two marine gears with fixed-pitch fully submerged propellers, or waterjets. Engines shall have the same rotation.

200-1.2 The Contractor shall prepare calculations to support speed and power analysis, propeller selection and shafting design (CDRL 200-001). Propellers shall be selected for maximum speed at Full Load Condition, without exceeding the rating of the engine and shall make at least 103% of the nominal top engine RPM at Full Load Trial Condition. The boat propulsion system shall be free of critical torsional, longitudinal, and whirling vibrations throughout the operating range. Propulsion mass elastic system shall not produce vibratory stresses or deflections in excess of those permitted by the equipment/component manufacturers.

200-1.3 The propulsion system shall be capable of continuously operating at idle in neutral for 10 hours.

200-2 Propulsion Equipment Ratings

200-2.1 The manufacturers' ratings for the equipment shall be based on the average operating duty profile in Section 044-1. The manufacturer's ratings may have different conditions than will be found in service on the RB-M. The equipment's ratings shall be adjusted for auxiliary loads and environmental conditions that could vary the power available for propulsion. The power used to determine the acceptability to manufacturer's rating shall be the worst-case condition with adjustments for auxiliary loads and environmental conditions in both the additions to power for the driven equipment and deductions from power for the prime mover. The manufacturer's tolerances shall be taken at their most adverse limit.

200-2.2 The major propulsion system components shall be models from a current production series operated in commercial marine service or U.S. Government marine service for at least two years at the rating proposed for the RB-M. Changes to major propulsion system component model numbers or designation are acceptable as long as the Contractor can demonstrate that the major propulsion system components are a continuation of models from a current production series.

233 PROPULSION DIESEL ENGINES

233-1 Emissions

233-1.1 The engines shall be certified by the manufacturer that they comply with exhaust emission regulations of MARPOL (73/78) Annex VI (*threshold*). The manufacturer shall certify that the engines will comply with exhaust emission regulations of 40 CFR 94, Control of Air Pollution from Marine Compression-Ignition Engines, and will provide the certification of compliance when the regulations are effected 1 January 2004 (*objective*).

233-2 Engine Rating

233-2.1 The propulsion diesel's declaration of power shall be ISO standard power as defined in ISO 3046/1. The propulsion engine's Original Equipment Manufacturer (OEM) shall make the declaration of ISO standard power. The propulsion engine OEM shall provide maintenance intervals and requirements.

233-2.2 The service power as defined in ISO 3046/1 shall be declared. The service power shall account for parasitic loads of equipment not installed during determination of ISO standard power and worst case engine room environmental conditions from Section 070-4 and variations of fuel caloric values and installed exhaust system back pressure. Additional auxiliary loads will consider an efficiency of no greater than 0.8. The fuel consumption and oil consumption declarations shall be at the service power. ISO 3046/1 governs all adjustments. USCG fuel shall be MIL-F-16884J grade F76 with a minimum cetane rating of 42. The engine OEM shall specify the lubricating oil; MIL-L-2104 is preferred.

233-2.3 Engines shall also be compatible with fuels specified in COMDTIST M9000.6, Chapter 541, Section B. JP-5 fuel may be used infrequently and losses in power due to its use may be neglected, unless they could damage engine.

233-3 Fast Lubricating Oil Change System (FLOCS) Connection

233-3.1 A FLOCS connection shall be installed on both diesel engines and both marine gears to allow for convenient oil changes using a USCG-furnished portable pump and oil collection container.

233-3.2 The FLOCS connection shall consist of a lube oil flexible suction hose and a 3/4-inch male quick disconnect, positive shut-off coupling individually connected to the engines and marine gears.

233-3.3 Fittings shall be compatible with a FLOCS 15 Oil Evacuation Unit, Aeroquip Part No. FF9315-01, and NSN 4930-01-191-6166.

233-4 Crankcase Fumes

233-4.1 A system shall be provided to dissipate all oil fumes generated in the engine through the engine intake.

233-5 Engine Cooling System

233-5.1 Engine jacket water shall be cooled with raw water through an inboard heat-exchanger system. Raw water shall be strained through a duplex-type strainer. The strainers shall have provision to clean one bowl, while operating the engine on the adjacent bowl. Each engine shall have a separate sea suction, and shall be fitted with a stainless steel ball type seacock.

233-5.2 Raw water systems shall be able to be drained completely and have a provision for flushing and winterizing.

233-5.3 Engine components, except charge air aftercoolers and fuel coolers, shall be cooled with jacket water. The jacket water shall meet the requirements on COMDTINST 9000.6, Chapter 233. Jacket water may be used as a heat source for cabin heating.

233-6 Emergency Shut Down

233-6.1 Each engine shall be provided with an emergency shut down device which shall stop the flow of combustion air to the engine. The device shall be of the type which requires manual resetting before the engine can be restarted. It shall be operated remotely from the pilot house. The actuator for the port engine shall be placed to the port side of the corresponding actuator for the starboard engine.

233-7 Hot Section Shielding

233-7.1 Protective guards, jacketing, or shielding shall be provided wherever persons or gear might come in contact with exposed surface temperatures of the engine, or its components, that exceed 200 degrees Fahrenheit.

233-8 Exhaust System

233-8.1 The exhaust system shall prevent cooling water, seawater or rain water from entering any engine with one, both or neither engines running.

233-9 Jacket Water Heating System

233-9.1 Engine jacket water shall be heated to provide for rapid starting in colder climates. The jacket water heating system shall be powered by shore power only. The jacket water heating system shall be thermostatically controlled to provide a minimum of 120 degrees Fahrenheit jacket water temperature at zero degrees Fahrenheit outside air temperature.

241 MARINE GEARS

241-1 Propeller Craft

241-1.1 The port and starboard gears shall be identical except that the gears shall be arranged for propellers to turn outboard (starboard clockwise and port counterclockwise as viewed from astern) while going ahead.

241-2 Waterjet Craft

241-2.1 Waterjet craft shall have gears for operating the engines with the waterjets disengaged and for reversing to back flush the waterjets.

241-3 Gear Lubrication System

241-3.1 A FLOCS connection shall be installed. (See Section 233-4).

245 SHAFTING, BEARINGS AND PROPELLERS (if used)

245-1 General

245-1.1 The propeller shall not exhibit cavitation damage on trials. Propeller blade tip clearance shall be at least 12% of the propeller blade diameter. Propellers shall be commercially available off the shelf.

245-1.2 Propeller tailshafts shall be provided with dripless shaft seals.

245-1.3 Shaft and drive component materials shall be selected to minimize galvanic corrosion. Shafting shall be electrically isolated to prevent galvanic corrosion.

245-1.4 Propellers shall be made of nickel aluminum bronze, ABS type 4. ABS requirements for testing are waived.

245-1.5 Appendages, including rudder, shafts, and propellers, must be protected to minimize damage during groundings or impact with floating debris.

245-1.6 If a conventional shaft and propeller system is installed, rudders shall be installed such that they permit shaft removal without rudder removal.

245-1.7 Propeller blades and hubs shall have a surface finish of 125 RMS. All propeller blades and hubs shall be free of flaws in accordance with Table 1.1 and Figure 1.1 of ABS Guidance Manual for Bronze & Stainless Steel Propeller Castings, 1984. The dye penetrant examination is not required.

245-1.8 Propellers shall be statically balanced on an approved anti-friction bearing equipped arbor. Residual imbalance is to be less than the quantity W times 11,260 divided by N squared, ounce-inches (where W equals propeller weight in pounds and N equals maximum propeller RPM), or one ounce-inch, whichever is greater. Blade area from which metal is removed in correcting the unbalance shall be as large as possible but shall not approach the edges within at least 20% of the chord length of that radius.

245-1.9 The Contractor shall provide a propeller measurements report (CDRL 245-001). Propeller tolerances shall be in accordance with ISO 484/2 Class II, except as noted:

245-1.9.1 Methods for Measuring Pitch: Pitch may be measured by a “Pitchometer”, “Prop Scan” or other standard instrument for inspecting propellers that can be shown to be calibrated to, and to produce equivalent accuracy to the methods of Section 4 of ISO 484/2 for Class II propeller in addition to the methods of Section 4.

245-1.9.2 Measurement Locations: Measurement of a section near the hub shall not be required where specified by ISO 484/2.

245-1.9.3 Pitch: Local pitch (Item a of Table 2 of ISO 484/2) shall not be controlled. Percentage tolerances in Table 2 shall be as listed below.

245-1.9.3.1 Mean pitch of each radius of each blade shall be within + 3% (Item b of Table 2).

245-1.9.3.2 Mean pitch per blade shall be within + 2.5% (Item c of Table 2).

245-1.10 Propulsion tailshafts shall meet ASTM A276 type XM19.

245-1.11 Propeller tailshafts shall have a factor of safety of 7.5 in accordance with ABYC project P-6.

245-1.12 The propeller shaft coupling for tailshafts shall be Type 1 Internal pilot, Taper Bore per SAE J756 as modified by ABYC Project P-6.

245-1.13 The length of tailshaft bearings shall be 4 times the diameter of the shaft.

247 WATERJETS (if used)

247-1 Performance Requirements

247-1.1 Waterjet impeller shall not cavitate so as to overspeed or damage the impeller in any operational condition including towing conditions. Voluntary operator RPM limits to preclude cavitation are only allowable in towing condition. If engine RPM must be voluntarily limited by the operator to control cavitation in towing conditions, limits shall be posted to be visible at the throttle station(s).

247-2 Steering and Reversing Gear Deflection and Performance

247-2.1 The proposed waterjet shall be provided with integral thrust reversing capabilities. The full range of steering shall be available when going astern.

252 PROPULSION CONTROL AND MONITORING SYSTEMS

252-1 Roll Over Engine Control (*objective*)

252-1.1 If the RB-M is self-righting, the engine controls shall have an automatic feature which brings the controls to idle speed if the boat is inverted. This feature intends to limit water being drawn into the engine space should the intake become submerged. The throttle settings shall remain at idle until the controls are reset by the operator.

259 EXHAUST SYSTEMS

259-1 General

259-1.1 The engine exhaust system shall meet the installation requirements of ABYC Project P-1.

259-1.2 Exhaust system components shall be resistant to failure in the event of interruption of any cooling water which is normally provided. A cooled exhaust may utilize 5086, 5456 or 6061 aluminum or marine exhaust hose. Dry exhaust systems manufactured from metal shall be 316L CRES for engines with maximum exhaust gas temperatures of less than 750°F. If exhaust temperature can exceed 750°F then metal systems shall be 321 or 347 CRES.

259-1.2.1 Proprietary alloys or other materials having enhanced corrosion resistance, increased resistance to high temperatures, lighter weight or superior strength compared to 316, 312 or 347 stainless steel may be offered by the Contractor as substitutes provided that the proposed

material is in no way inferior to the required materials with respect to properties required for the intended service.

259-1.3 Exhaust system components which require insulation, shall utilize portable insulation blankets manufactured to MIL-STD-769J. The materials shall have an impervious cleanable cover which does not adsorb oils.

259-1.4 The exhaust system shall be self-draining. A pressure tap connection shall be provided in each exhaust system near the engine connection to be used for taking exhaust back pressure measurements.

261 FUEL SYSTEM

261-1 General

261-1.1 Each fuel tank shall have a fuel level indicating gauge with a readout at the operator's control console.

261-1.2 The fuel system shall be provided with a fuel flow meter and total fuel consumed indicator for each engine. Fuel flow readings shall be in gallons per hour and total fuel consumed readings shall be in gallons. The flow meter shall be equipped with a fuel consumed reset switch adjacent to the gauge. (see Section 410)

261-1.3 Each diesel engine shall include a supply pump, a relief valve on the discharge side of the pump, a primary filter-separator, a secondary filter, and the necessary piping, valves and fittings.

261-1.4 The fuel system shall have independent supplies and returns. The fuel supply shall have a fire safe shut-off ball valve mounted on the tank penetration. The fire safe shut-off valve shall be remotely operated to the shut position from a manned compartment. Fuel returns shall be arranged to prevent siphoning.

261-1.5 Multiple tanks shall have manifolds to allow suction from and return to any tank.

261-2 Tank Stripping

261-2.1 The tank shall be equipped with a means to strip out residual water or fuel to a portable tank using a hand pump. Connections shall be easily accessible.

SECTION 3: ELECTRICAL SYSTEMS

300 ELECTRICAL POWER GENERATION AND DISTRIBUTION SYSTEM

300-1 General Requirements

300-1.1 A 24/12 VDC and a 120 VAC electrical system shall be provided.

300-1.2 The design, construction and installation of all system components shall be suitable in all respects for marine service and the intended application in accordance with ABYC.

300-1.3 System and equipment grounding and bonding shall be in compliance with ABYC.

300-1.4 Electrical equipment shall be selected which is compatible and operational with the electrical power frequency, voltages and amperage fluctuations, excursions and tolerances of the electrical power generation and distribution system for all operating conditions in accordance with ANSI-C84.1.

300-1.5 The Contractor shall provide an AC and DC load analysis, a battery load analysis with sizing profile, and voltage drop calculations. (CDRL 300-001)

300-1.6 Electrical enclosures shall be rated for the intended use and environmental conditions contained in Section 070 in accordance with NEMA 250 and/or IEC 60529.

300-2 AC Power System

300-2.1 A complete 120 VAC single phase, three wire, 60 hertz electrical power generation and distribution system shall be installed on the RB-M in accordance with ABYC Project E-8, Diagram #6 or #7. When in port 120 VAC electrical power shall be supplied to the RB-M via single phase, 60 Hertz 2 Pole, 3 wire system.

300-3 DC Power System

300-3.1 A 24 VDC system shall be provided for propulsion engine starting and power distribution.

300-3.2 The RB-M's electric plant shall be designed such that all loads vital to the operation of the craft and safety of the crew are supplied from the DC power distribution system.

300-4 Electrical Equipment Installation

300-4.1 Equipment shall operate such that when power is interrupted and restored (i.e. power transfer), no damage will result to any component or part of the equipment.

304 WIRING AND ELECTRIC CABLE

304-1 General

304-1.1 Cables or wiring leading to shock-mounted equipment shall be formed into a coil or loop to minimize the effect of movement or vibration.

304-1.2 Cable conductors within equipment or enclosures shall have sufficient length to facilitate tracing, troubleshooting, and opening and closing of hinged doors to prevent conductor damage.

304-1.3 Conductor groups inside of equipment or enclosures shall be neatly formed and routed to prevent damage without crossing over or obstructing access to terminals.

304-1.4 All electrical cable external to purchased components shall be in accordance with IEEE-STD-45.

304-2 Cable Installation and Wiring Methods

304-2.1 Cabling/conductors passing through watertight boundaries, decks or bulkheads shall be installed to maintain watertight integrity of the structure and protected against chafing by the use of abrasion-resistant grommets.

304-2.2 Cables shall be grouped into cable harnesses wherever possible.

304-2.3 Cables shall not be located behind or embedded in insulation, or where excessive heat and gases may be encountered, such as above engines, through ventilation ducts, or in fuel tanks.

304-2.4 Wires and cables shall be kept completely clear of engine removal soft patches, except for interior lighting wires and cables.

304-2.5 Individual wires and harnessed wires shall be supported with clamps or straps, at least every 18 inches on horizontal runs and every 14 inches on vertical runs, and attached to fixed structural members of the craft. Clamps or straps used for wire and cable support shall each be secured by two screws, except that clamps supporting one cable, number 10 AWG twin (or smaller), or multi-cables which do not exceed 3/4 inch diameter, may be of the one screw type. Metal supports shall be designed to secure cable without damage to insulation and shall be at least 1.2 inch wide. Non-metallic clamps or straps subject to failure during a fire shall not be used where such failure could cause an additional hazard, such as wiring located over moving shafts.

304-2.6 Cables shall be strapped in hangars to prevent sagging between hangar supports. Spare area is to be provided and shall be no less than that required for the average size cable in the raceway. Raceways with only one cable are not required to have spare area. Hangar spacing shall not exceed 21 inches.

304-2.7 Exposed wiring subject to mechanical damage shall be protected by covers.

305 ELECTRICAL DESIGNATION AND MARKING

305-1 General

305-1.1 The RB-M shall have all switches, electrical controls, components, and receptacles marked.

305-1.2 Each conductor shall be marked to identify its function in the electrical system (as stated in ABYC Project E-9.16 with the exception that tape not be used to mark wiring).

310 DC ALTERNATORS

310-1 DC Alternator Requirements

310-1.1 At least one alternator shall be mounted on each main diesel engine. The alternators shall be belt-driven with a voltage regulator. The alternator drive ratio shall be adjusted so that the alternator delivers sufficient power output at engine idle speed to meet system load requirements. A system shall be provided that permits charging of each battery bank without potential for alternator damage.

310-1.2 All engine-driven alternator rectifiers shall be capable of being operated both individually and in parallel at any engine rpm. When operating in parallel, the alternator rectifiers shall share the craft's loads equally.

310-1.3 The alternators shall be provided with reverse polarity protection and overload protection.

310-1.4 Alternators shall be fungus proofed.

310-1.5 The alternator rectifier units, regulators, and control accessories shall be shielded from water entrance with minimum interference to air flow.

310-1.6 Alternator voltage regulators with adjustment capability shall be provided with a locked setting so that adjustment travel will not occur.

313 BATTERIES AND BATTERY CHARGING

313-1 General

313-1.1 The RB-M shall have two battery banks separated for hotel load and engine starting with a battery parallel switch to connect both battery banks for emergency engine starting.

313-1.2 A selector switch shall be provided to isolate the battery banks.

313-1.3 Self-regulating battery chargers shall be provided to charge the battery banks from the 120 VAC distribution system

313-1.4 Battery chargers shall be in accordance with ABYC Project A-20, and shall provide DC output power compatible to the battery manufacturer's requirements for voltage and current regulation with AC input power fluctuations and excursions supplied within ANSI tolerances for power supplied from the utilities.

313-1.5 Batteries in each bank shall be sized to meet the maximum DC load demand as determined by the DC Power and Load Analysis performed in 300-1.5.

313-1.6 The batteries shall be sized to provide emergency back up power for at least four hours for the items shown in Table 313-1.

Table 313-1 Emergency Power Requirements

Item	Usage
VHF Radio	50% transmit 50% receive
Navigation Lights (underway)	100%
Propulsion System Controls	100%
Two Bilge Pumps	100%
GPS	100%
Bilge and Fire Alarms	90% Standby 10% Active

313-2 Batteries

313-2.1 The starting and hotel load batteries shall consist of marine lead-acid sealed gel cell batteries built in accordance with IEEE-STD-45.

313-2.2 Batteries shall be installed in drip-proof, ventilated battery boxes with a means to hold the battery/battery box combination in place when inverted.

314 ISOLATION TRANSFORMER**314-1 General**

314-1.1 The RB-M shall have an isolation transformer for the shore power supply. The inlet receptacle shall be electrically isolated from the boat in accordance with ABYC.

320 GENERAL REQUIREMENTS FOR ELECTRIC POWER DISTRIBUTION SYSTEM**320-1 Power Distribution Panels**

320-1.1 Digital meters for current and voltage shall be installed at the breaker panel to indicate the total electrical load for all voltage systems.

320-1.2 The DC panels shall be configured to provide power both underway and while connected to shore power.

320-1.3 The number of spare DC circuits shall be no less than 20 percent.

320-1.4 The 120 VAC power distribution system shall be provided with a master circuit breaker, and individual breakers (minimum 10 amps) with no less than 20 percent for spares.

320-1.5 The distribution panels shall be a commercially available marine type panel for use on small craft and shall also be a standard unit manufactured in accordance with IEEE-STD-45. Each breaker shall be clearly labeled to indicate its service and its position clearly visible.

320-1.6 The RB-M shall have overcurrent and short circuit protective devices for all electrical power distribution circuits. Circuit breakers shall be used in lieu of fuses for primary circuit protection. Magnetic hydraulic circuit protective devices shall not be used. Circuit breakers shall be of the thermal magnetic type and shall be of the bolt and screw in type.

320-1.7 The circuit breaker panel shall use commercially available, standard unit components as manufactured in compliance with ABYC Project E-9.

320-1.8 Panel boards that do not have doors shall be provided with circuit breaker guards to prevent accidental activation or deactivation.

320-2 Shore Power Facility

320-2.1 Shore power shall be supplied via the 120 VAC distribution system. The RB-M shall have a portable cable to connect the craft's shore tie receptacle to the shore side receptacle and shall be 50 feet in length. The cable shall be dead ended on the shore side for future shore side installations. The shore tie plug and receptacle on the boat end shall be a Hubbel Inc., Model M4100C12R or equal.

320-2.2 Shore tie cabling, circuit breaker and receptacle shall be sized based on the results of the system load and power analysis, allowing 20 percent margin for future growth.

320-3 Portable Equipment Power Outlets

320-3.1 The RB-M shall be provided with six 12 VDC watertight auxiliary/accessory plugs. One shall be provided adjacent to each of the four crew seats, one adjacent to the galley, and one accessible from the aft deck. All outlets shall be combined on a single circuit with a rating of at least 15 amps.

320-3.2 The RB-M shall have two 120 VAC GFCI duplex marine grade outlets, one each in the engine space and in the pilot house. The circuits shall be on a 15 amp circuit and are not required to be used underway.

332 LIGHTING

332-1 General

332-1.1 The RB-M's lighting requirements are shown in Table 332-1.

Table 332-1 RB-M Lighting Requirements

Compartment	Usage	Type
Cabin and pilot house	General	White
	Night Operations	Red or Blue
	Emergency	Waterproof Low Level Lighting
Machinery Spaces and Interior Spaces	General	White
	Emergency	Waterproof Low Level Lighting
Exterior Deck	General	Waterproof Low Level Lighting

332-1.2 Lighting fixtures shall be located to reduce glare and specular reflection, and to provide adequate distribution within spaces as required for working conditions.

332-1.3 Florescent fixtures shall not be used.

332-1.4 Emergency lighting shall be LED or equivalent with a separate emergency battery supply that will power the lights for at least 4 hours of operation.

332-2 Search Light

332-2.1 The RB-M shall have a remote-controlled search light of at least 200,000 candle power. The controls shall be mounted within easy reach of the helmsman.

332-2.2 The searchlight shall be able to rotate 360 degrees horizontally, 10 degrees above the horizontal, and 45 degrees below horizontal. The searchlight shall be able to rotate prior to energizing the light.

332-3 Law Enforcement Light

332-3.1 The RB-M shall have flashing blue law enforcement light(s). The light(s) shall be marine grade, strobe type, and shall be located to provide maximum visibility from afar, but not shine on the crew.

332-4 Floodlights

332-4.1 The RB-M shall have port, starboard, forward and aft facing floodlights to illuminate the perimeter of the RB-M out to a distance of 15 feet surrounding the vessel. Floodlight controls shall allow for selection of the illumination area.

332-5 Navigation Lights

332-5.1 The RB-M shall have navigation lights in accordance with COMDTINST M16672.2 for the inland and international requirements corresponding with underway operations, anchoring, towing astern less than 200 meters, and towing alongside.

SECTION 4: COMMAND, CONTROL, COMMUNICATION

400 COMMAND AND CONTROL AND COMMUNICATION

400-1 General

400-1.1 All cables associated with electronic equipment shall be run continuous; there shall be no splices. The only exception to this will be for quick disconnects associated with removable items. If connection or distribution points are needed, terminal strips with protective covers shall be used and shall be accessible to technicians.

400-1.2 The RB-M shall have all controls and gauges in sight of the operator, clearly identifiable, accessible and operable during daytime, nighttime and cold weather operations and during aggressive craft maneuvers.

400-1.3 All RB-M gauges and controls shall be of the same color illumination and shall be dimmable for nighttime operations.

403 PERSONNEL SAFETY

403-1 Performance and General Requirements

403-1.1 The Contractor shall install warning signs, tags, and marking for hazards. COMDINST M10360.3 shall be followed for proper lettering and color markings for electronic and electrical equipment. The signs shall be installed in locations where personnel could come in contact with or be exposed to the hazard. A Radiation Hazard (RADHAZ) warning sign shall be installed at personnel routes leading to antennas. Signs warning personnel to disable the rotating antenna shall be installed next to the antenna disable switch.

404 RF TRANSMISSION LINES AND CABLES

404-1 Scope

404-1.1 This section sets forth the general requirements for radio frequency cabling and provides guidelines for installation.

404-2 Performance and General Requirements

404-2.1 Radio frequency transmission lines shall meet the following general and installation requirements:

404-2.1.1 Radio frequency transmission lines shall be installed to meet the requirements of IEEE-STD-45, unless otherwise specified.

404-2.1.2 Be kept to a minimum length.

404-2.1.3 Located to provide protection from mechanical abuse and heat damage.

404-2.1.4 Located to avoid physical or electrical interference with equipment, cables, or other radio frequency transmission lines.

404-2.1.5 Electrically balanced wherever necessary.

404-2.1.6 The entrance of moisture and dirt shall be prevented. Non-solid dielectric lines shall be installed so there are no pockets in which moisture can collect.

404-2.1.7 Installed so that the characteristic impedance of each line is not materially changed.

404-2.1.8 Installed so that they will not be disturbed by removal of deck plates, gratings, or machinery.

404-2.1.9 Installed so as not to impair the airtight or watertight integrity of decks or bulkheads. Penetration of ship structure shall comply with requirements of structural sections of these Specifications.

404-2.2 When installing cable, force shall not be applied which changes the dimension of, or otherwise damages, the mechanical and electrical properties and characteristics of the cable. Cables shall not be installed in areas where the ambient temperature, plus the center conductor temperature rise, exceeds the maximum temperature rating.

404-3 Coaxial Cable

404-3.1 Standard methods shown in publication IEEE-STD-45 shall be used for:

404-3.1.1 Entry of coaxial cables to accessories, equipment, and wiring boxes.

404-3.1.2 Passing coaxial cable through bulkheads.

404-3.1.3 Protection of cable against heat, condensation, and mechanical damage.

404-3.1.4 Supporting and securing cable to decks and bulkheads.

404-3.2 Coaxial cables shall be installed so that equipment servicing, equipment deflection, deflection of bulkheads, and maximum movement of expansion joints will not subject the cable to tension or shear damage. Sag between hangers shall be uniform for each row of cables in racks so that the clearance between rows will be the same throughout the cable run. Sag shall be limited to that allowed for electric cable in similar runs. Whenever cables enter stuffing tubes, the angle of approach shall be such as to allow tightening of gland nuts without the necessity of flexing cables.

404-3.3 Coaxial cables shall not be secured directly to bulkhead plating, but shall be supported on beams or hangers.

404-3.4 Coaxial cable shall enter equipment enclosures in accordance with the following:

404-3.4.1 Watertight. Through stuffing tubes in locations as provided on the equipment and best suited to the disposition of the cable.

404-3.5 Non-watertight. Through cable clamps located in bottom or sides of the enclosure; if top entrance is more practicable, stuffing tubes shall be used.

404-3.6 The inside bend radius of coaxial cable shall be greater than 10 times the cable diameter, except when the cable is subject to repeated flexure, in which case the inside bend radius shall be greater than 20 times the cable diameter.

404-3.7 Terminal boxes, branch boxes, or other forms of standard electric wiring equipment shall not be used to terminate or connect coaxial cable. Coaxial cable shall not be spliced.

404-3.8 Coaxial cables shall be kept to a minimum length.

404-3.9 Coaxial cables shall be electrically balanced as required by equipment manufacturer.

404-3.10 Coaxial cables shall be installed so that the characteristic impedance of each line is not changed.

404-3.11 Coaxial cables shall be located to avoid physical or electrical interface with equipment, cables, or other frequency transmission lines.

404-4 Cable Routing

404-4.1 Cables forming parts of different electronic circuits shall be routed in separate wireways wherever practicable. Cables shall be routed on the inboard side of beams or other supporting structures to provide additional protection. Cables shall be located so that the maximum number of circuits will be maintained in service in case of casualty to a single area. Cables near hydraulic fluid piping shall have drip-proof shields or other barriers installed to protect from leak damage. In addition, cables installed in exterior locations shall be installed to meet the shielding and grounding requirements of MIL-STD-1310G.

404-4.2 Stuffing tubes or multi-cable transits shall be used for passing coaxial cables through watertight, airtight, fume tight, or light-tight decks or bulkheads.

404-4.3 Bushings and collars shall be used wherever cables penetrate non-tight bulkheads and decks.

404-4.4 All cable connectors exposed to weather shall be waterproofed using silicon grease impregnated heat shrink. RTV or similar compounds shall not be used.

404-5 Grounding and Bonding

404-5.1 All RF transmission lines and cables shall be electrically bonded and shall be routed within the RB-M structure to protect against EMI. Cables that must be routed to topside or exposed locations shall be shielded, either by use of shielded cables or by use of single or multi-cable conduit, or both. The Contractor shall provide a test procedure (CDRL 404-001) and a test report (CDRL 404-002).

405 ANTENNA REQUIREMENTS

405-1 General

405-1.1 Antennas shall be physically separated to reduce electrical interaction and to avoid physical contact due to antenna deflection caused by ice loading, wind, or sea conditions.

405-1.2 Antennas shall be mounted so their failure will not foul other antennas.

405-1.3 Antennas, insulators, or radomes shall not be painted or coated. The following, more specific, installation practices apply:

405-1.3.1 Wire antennas shall be continuous from insulator to the extreme end, and shall be installed free from kinks, sharp bends, deformations, and broken strands. Shackles, insulators, and similar antenna hardware shall be sized so that the antenna wire will fail before hardware.

405-1.3.2 VHF and UHF whip antennas should be kept at least one wave length from any vertical conductor. Supporting structures shall be made electrically smaller by inserting insulators into the length on the structure.

405-1.3.3 Antenna couplers shall be installed and connected to the antenna in a manner expected to minimize detuning of the circuit.

405-1.3.4 Lightning protection shall be provided at the base and at feed-through insulators where practicable.

406 ELECTROMAGNETIC INTERFERENCE (EMI)

406-1 General

406-1.1 The Contractor shall provide a plan to control the effect of EMI throughout the interior and exterior of the RB-M (CDRL 406-001).

406-1.2 The Contractor shall prepare a test procedure to evaluate on the RB-M (CDRL 406-002). Testing shall consist of both dockside and at sea testing, and shall entail inspection and monitoring of the equipment and its installation. The results of this testing shall be documented in a report (CDRL 406-003). The Contractor shall be responsible for correcting any unacceptable EMI found as a result of that testing and repeating the tests. Testing shall be conducted under the following conditions:

406-1.2.1 Topside equipment shall be in the final configuration.

406-1.2.2 The topside shall be clean and free of scaffolding and obstructions.

406-1.2.3 All electronic equipment, systems, and subsystems shall be operational.

406-1.2.4 Personnel shall be assigned to operate the equipment.

406-1.2.5 Heliarc equipment shall not be in use during EMI testing.

406-1.2.6 The testing shall be performed in an RF free environment.

406-2 Radiation Hazard (RADHAZ)

406-2.1 The Contractor shall identify, eliminate, or control by engineering design or protective equipment, or a combination thereof, personnel exposure levels, which exceed contractual requirements. The Contractor shall perform RADHAZ Testing to assure contractual compliance.(CDRL 406-004)

410 REQUIREMENTS FOR CONTROL STATIONS AND DATA DISPLAY SYSTEMS**410-1 General**

410-1.1 Equipment which is to be installed in the pilot house will be capable of withstanding repeated exposure to water which is brought into the pilot house on crew members.

410-1.2 All displays shall have the same color dimmable lighting for night operations.

410-1.3 A loop of excess cable shall be provided to allow removal of the instruments, systems and displays for accessing the back of the associated items by turning the items over without disconnecting any conductors.

410-2 Location of Controls, Displays and Equipment

410-2.1 Table 410-1 shall be used as guidance in determining the desired location of pilot house controls, displays and equipment.

410-2.2 Items which are classified as “visible and reachable” should be readily accessible in the forward facing seated position, and should not require major body movements to see displays or to use equipment controls.

410-2.3 Items which are classified as “reachable” should be within easy reach in the seated position. Displays associated with these items should be visible, but may require the operator to bend or twist in his seat to view the display. Controls which will be in frequent use during operations, such as propulsion and helm controls, should allow for easy operation with minimal body movements.

410-2.4 Items which are classified as visible should be located so they can be easily seen from the seated position without major head or body movements.

410-2.5 ASTM 1166-95a provides guidance as to the efficient location of controls, displays and equipment.

410-2.6 If arrangements do not allow for items to be efficiently shared, then multiple displays or controls may be provided.

410-3 Navigation Station

410-3.1 The navigators station shall be provided with storage for the following at a minimum: navigation tools listed in the outfit list (Table 600-2), at least 4 folded charts, the current chart, tide tables, and navigation rules.

410-3.2 The navigators station shall include a work surface that is suitable for the use of the navigation tools with folded charts.

410-4 Instruments and Alarms

410-4.1 The propulsion system shall have warning lights and audible alarms. The warning light and audible alarm shall simultaneously function to draw the operator's attention to the displays. The warning light shall not extinguish until the equipment pressure or temperature has returned to normal.

410-4.2 The RB-M shall provide the ability to monitor the following propulsion system parameters and alarms:

Primary Indicators:

- Tachometer
- Engine Water Temperature
- Engine Lube Oil Pressure
- Reduction Gear Oil Pressure
- Engine Hour

Alarm Indicators (Light and Audible Alarms):

- Water Temperature (High Water Temperature)
- Engine Lube Oil Pressure (Low Oil Pressure)
- Reduction Gear Oil Temperature (High Oil Temperature)
- Reduction Gear Oil Pressure (Low Oil Pressure)
- Alternator Failure

421 COMPASS

421-1 Magnetic Compass

421-1.1 The RB-M shall have a permanent or portable compass that mounts in a bracket.

421-1.2 The compass shall be capable of compensation for deviation.

421-1.3 The compass shall be mounted directly in front of the helmsman in easy view of the helmsman when facing forward.

421-2 Electronic Compass

421-2.1 An electronic, flux gate compass with sensor, display and digital data output, compatible with the RB-M electronics, shall be installed as the primary navigation compass.

Table 410-1 Pilot House Controls, Displays and Equipment

	Helm	Shared Navigator & Helm	Navigator	Crew	Navigator or Crew
Visible and Reachable	<ul style="list-style-type: none"> • Trim Controls and Display • Secondary Chart Plotter/Radar Navigation Display 	<ul style="list-style-type: none"> • Engine Displays and Alarms 	<ul style="list-style-type: none"> • Primary Chart Plotter/Radar Navigation Display • Computer Display • GPS 	<ul style="list-style-type: none"> • Secondary Chart Plotter/Radar Navigation Display 	
Reachable	<ul style="list-style-type: none"> • Primary Helm (Wheel) • Primary Propulsion Controls • Crew Communications • Load Hailer • Primary VHF • Search Light • Fire Alarm System. • Window Equipment. • Engine kill • Fire Suppression. • Horn • Auto Pilot 		<ul style="list-style-type: none"> • Secondary Helm* • Secondary Propulsion * • Computer Keyboard and Mouse • Crew Communications • Chart Light • Secondary VHF • HF Radio • VHF-RDF • IR Control • UHF Radio 	<ul style="list-style-type: none"> • Crew Com • Auxiliary VHF 	<ul style="list-style-type: none"> • Deck Lights • Console Dimmer • Bilge Pump Controls and Alarms • HVAC Control
Visible	<ul style="list-style-type: none"> • Magnetic Compass • Electronic Compass 	<ul style="list-style-type: none"> • Rudder Angle Indicator • IR Display • Depthsounder 	<ul style="list-style-type: none"> • Fuel Gauge • Fuel Flow Meter 		

* Objective.

423 ELECTRONIC NAVIGATION SYSTEMS

423-1 General

423-1.1 All of the RB-M's electronic navigation equipment shall be from the same manufacturer. The Coast Guard reserves the right to change the Integrated Navigation Suite when/if a Coast Guard standard configuration is identified.

423-1.2 All of the RB-M's displays shall be flush mounted.

423-2 Environmental

423-2.1 The RB-M's radar antenna shall be able to rotate a minimum of 24 rpm in 100-knot relative winds.

423-2.2 The RB-M's display units shall be waterproof, meeting IEC 60529 Ingress Protection (IP) 55. Antenna units shall meet IEC 60529 IP56 at a minimum.

423-3 Integrated Navigation System (INS)

423-3.1 The RB-M shall have an INS consisting, as a minimum, of one radar/chart plotter, one DGPS, one depth sounder, and one fluxgate compass. Capability to add additional displays/interfaces to the system shall be available. Water speed and water temperature sensors are optional.

423-3.2 The RB-M's INS system shall have independent dual displays for latitude/longitude, depth, and waypoint display/entry.

423-3.3 The RB-M's INS system shall have the ability to pass waypoints/routes between the chart plotter and GPS units, as required.

423-3.4 All RB-M INS components shall be NMEA 0183 standard compatible, though proprietary buses can be utilized as long as the NMEA 0183 standard requirement is met.

423-4 Radar/Chart Plotter Display Unit

423-4.1 The RB-M shall have one primary and two secondary radar/chart plotter display units. The displays shall be approximately 10"-12" color Thin Film Transistor (TFT) Liquid Crystal Display (LCD) with a minimum of 640 x 480 pixel resolution. Intensity control shall allow direct sunlight viewing in addition to nighttime viewing without loss of night vision for operator.

423-4.2 The RB-M's radar/chart plotter display unit shall have input and output ports in the NMEA 0183 format. A proprietary bus is authorized.

423-4.3 The RB-M's radar/chart plotter display shall have the capability to display electronic charts with radar overlay, shall have the ability to use single or split screen options, and the unit shall be capable of displaying Differential Global Positioning System (DGPS), heading/compass, and depth data in all screen modes.

423-4.4 The RB-M's radar/chart plotter unit shall have the ability to accept external sensors for heading, depth, GPS and DGPS.

423-5 GPS/DGPS Characteristics

423-5.1 The GPS/DGPS display unit shall have the capability of displaying DGPS and depth data on one display with compass heading data as optional.

423-5.2 The GPS/DGPS unit shall have, at a minimum, 1,000 waypoints and 50 or more routes. The units shall display waypoint by name and number. The unit shall be able to ship track with 4,000 track points, have a 12 channel receiver, and a speed accuracy of 0.3 knots.

423-5.3 The GPS/DGPS unit will have the ability to accept external input for a depth sounder and a fluxgate compass (optional).

423-5.4 The GPS/DGPS antenna shall be an active DGPS antenna to allow dual display of the DGPS data at the GPS and radar/chart plotter displays.

423-6 Radar Characteristics

423-6.1 The RB-M's radar shall have the following display modes and characteristics, at a minimum:

- Course-Up, North-Up, with true motion optional.
- Range scales of 0.125 to 48 nautical miles with 10 or more steps.
- Tracking capability with auto and manual, acquired with minimum of ten targets, and ability to display target trails.
- Two variable range markers.
- Two electronic bearing lines with one being a floating type.
- A bearing accuracy of one degree or less.

423-6.2 The RB-M's radar antenna array shall be 3.5-4' open arrays with less than 2.3-degree horizontal beamwidth.

423-6.3 The RB-M's radar range accuracy shall be better than one percent of maximum scale in use.

423-6.4 The radar shall meet the following technical specifications:

- Power: 4 kW.
- Voltage: 12 or 24 VDC.
- Frequency: 9 GHz (X-band).

423-7 Chart Plotter Characteristics

423-7.1 The RB-M's chart plotter shall have the following display modes and characteristics, at a minimum:

- Course Plot, Navigation Data, Steering Display, Highway.
- North Up, Course Up presentation modes.
- Range scales of 0.125 to 48 nautical miles with 10 or more steps.

- 1,000 waypoints, 50 or more routes, route naming capability, display waypoints by name and number, and the ability to run routes in reverse.
- Waypoint entry via lat/long, bearing, and range of cursor.
- Ship track with 4,000 trackpoints minimum.
- Real world display with Course Over Ground, Speed Over Ground, Course Made Good, Lat/Long, estimated time of arrival, distance to waypoint, and cross track error, as a minimum.

423-8 Depth Sounder

423-8.1 The depth sounder shall be capable of indicating depth from 0 to at least 300 ft. A depth readout with programmable depth alarm shall be available. The system shall indicate depth digitally and graphically. The depth sounder shall have a dedicated digital display that is located where it is visible to both coxswain and navigator. In addition, the depth sounder shall be a component of the integrated navigation system to display the graphic output. The depth sounder shall have a through-hull transducer.

423-9 Other

423-9.1 Availability: Units will be available on the open market for a period of three years minimum after initial purchase. Upgrades to the base system shall be backward compatible to ensure INS operation.

423-9.2 Supportability: Units shall be supportable for a minimum period of three years after initial purchase.

426 AUTO PILOT

426-1 General

426-1.1 The RB-M shall have an auto pilot system having the following features: rudder feedback, adjustable rudder response, counter rudder circuit, adjustable sea state, automatic rudder trim, and electronic compass interface.

436 ELECTRICAL ALARM, SAFETY AND WARNING SYSTEM

436-1 General

436-1.1 The enclosed bridge shall have engine warning lights and audible alarms as specified in Section 410. The warning light and audible alarm shall simultaneously sound to draw the operator's attention to the displays. A watertight switch shall be placed at each location to silence and reset the audible alarm. The warning light shall not extinguish until the equipment pressure or temperature has returned to normal.

436-2 Bilge Alarm System

436-2.1 A bilge alarm system shall be provided which will automatically detect the presence of liquid six inches above the bilge pump suction in each compartment. Each sensor shall be equipped with an eight second delay such that it is not triggered by sloshing of small quantities

of bilge water. The system shall have a red indicator light for each compartment and an audible alarm which can be heard in all manned spaces and shall be discernable from all other alarm sounds. Indicator lights shall be located on the enclosed bridge console and may be part of the bilge system control panel.

436-2.2 A separate sensor shall be placed in the engine room below the automatic float switch for the bilge pumps. This alarm shall only be energized when the pumps are actuated in the automatic mode. These alarms shall be provided a means to alert the operators on shore when the boat is unmanned.

436-3 Fire Alarm System

436-3.1 A fire and smoke alarm system shall be installed in the engine room and all manned spaces. An alarm light and auditable signal located in the pilot house and means to alert all manned spaces when the boat is underway at full power shall be provided. When the boat is unmanned a means shall be provided to alert the operators on shore of fire alarm activation.

436-3.2 The fire and smoke alarms shall be discernible from all other alarms sounds.

439 INFRARED (IR) CAMERA SYSTEM (*Objective*)

439-1 Infrared Camera

439-1.1 The Contractor may provide and install a marine grade infrared camera system. The IR Camera shall be a solid-state thermal detector system with remote-controlled pan and tilt located in the pilot house. The system shall have a 10”-12” flat screen, “white hot”, display located in the pilot house.

441 RADIO SYSTEMS

441-1 General

441-1.1 The Contractor shall provide and install the radio systems detailed in Table 441-1:

Table 441-1 Radio Systems

Radio Type	Freq.	Quantity	Options Required
MOTOROLA W9 ASTRO SPECTRA VHF-FM* * Primary and Secondary VHF's	150.8MHZ – 174MHZ	2	All associated software & equipment necessary to support encrypted communications in the DES, DES-XL & DES-OFB modes. APCO-25 compliant. Selectable 50Watt (high power), 25 Watt (low power).
ROSS ENGINEERING DSC 500 VHF-FM* or equal * Auxiliary VHF	150.8MHZ – 174MHZ	1	Digital Selective Calling (DSC) Transmit & Receive analog voice and digital voice/data.
MOTOROLA W9 ASTRO SPECTRA UHF (OR EQUAL)	406.1MHZ – 420MHZ	1	APCO-25 Compliant, Mid- power option.
COMMERCIAL RUGGEDIZED MARINE GRADE HF	2MHZ - 30MHZ	1	100 – 150 Watt output power. Automatic Link Establishment (ALE) capable.

441-1.2 The radio systems detailed in Table 441-1, with the exception of the DSC VHF-FM radio, shall be configured with a remote head. The radio remote heads and the DSC VHF-FM radio shall be flush mounted in the pilot house consoles in accordance with Table 410-1.

441-1.3 Each radio system shall perform independently and have a dedicated antenna through which it can transmit and receive.

441-1.4 The communications suite shall be designed to provide for future upgrades to a new communications suite when a Coast Guard standard configuration is identified.

441-2 Radio Directional Finder

441-2.1 The RB-M shall have a VHF Automatic Direction Finder (ADF) system. The monitor/display shall be mounted in the pilot house and shall be viewable by the coxswain and navigator. The ADF system's salient features shall include:

441-2.1.1 A synthesized VHF-DF capable of reception covering the following ranges: 121.5 MHz and 147-170 MHz. The ADF shall scan the 147-170 MHz spectrum by frequency in no more than 5 kHz steps.

441-2.1.2 System bearing accuracy tolerance of +/- 5 degrees.

441-3 Emergency Position Indicator Radio Beacon (EPIRB)

441-3.1 The RB-M shall have a 406 MHz CAT II EPIRB with a built-in GPS location transmitter. The EPIRB shall be mounted in an exterior location.

441-4 Commercial Loudhailer

441-4.1 The RB-M shall have a commercial loudhailer/siren, independent of other communication systems, that meets the requirements of the COMDTINST M16672.2 for sound signaling. The loudhailer shall be provided with a speaker, mounted in accordance with the manufacturer's recommendations. The loudhailer must have listen back capability with a minimum of 30 watts of voice amplification.

441-5 Crew Communications System

441-5.1 The RB-M shall have a headset type crew communications system that allows the crew to communicate hands-free during operations. The crew communications system at the crew seat locations shall be able to transmit and receive through up to four onboard radios. At a minimum, the crew communications system must have outlets accessible from each crew seat, each gun mount location, the passenger compartment, the machinery spaces, and at the towbitt. The crew intercom headsets shall have the following features: submersible, active noise reduction, talk-through electronics for oral communications, fit-under standard ballistic helmets, and a noise canceling boom microphone.

441-6 Antenna Installation and Impedance Reports

441-6.1 The Contractor shall complete antenna installation and impedance testing (CDRL 441-001) and provide the report to the Coast Guard prior to initial testing.

443 HORN**443-1 General**

443-1.1 The RB-M shall have Kahlenberg Bros model SOA air horn, Brass Part # AH/35873/S/00000/NF or equal. The horn shall be operated by a momentary push button located within easy reach of the helmsman.

445 GENERAL USE COMPUTER**445-1 General**

445-1.1 The RB-M shall have a general use marine grade computer with flat screen display, keyboard, and mouse. This computer is intended for future Coast Guard systems capabilities. Integration with other on-board systems is not required. The system shall be capable of operation underway and on shore power. The system shall have a following features:

445-1.1.1 Mounting – the computer may be mounted in any interior location that is readily accessible and environmentally controlled. The display, keyboard, and mouse shall be located in the pilothouse as shown in Table 410-1.

445-1.1.2 Drives – the computer shall be outfitted with a 1.44 MB 3.5” floppy disk drive and a CD-ROM drive.

445-1.1.3 Display – The display shall of the weatherproof flat screen type with at least 12” diagonal size. The display shall be dimmable for night operations.

445-1.1.4 Mouse – the mouse shall be weather proof and shall be of the trackball or similar type that allows it to be fixed mounted.

445-1.1.5 Keyboard – the keyboard shall be of the weatherproof type with a numeric keypad. It may be mounted so that it is removable when not in use. When in use it shall be fixed, and may take up portions of the work surface that is designated for chart work.

445-1.1.6 Software – The computer shall be provided with MicroSoft Windows™ and Microsoft Office™ including Word™ and Excel™.

SECTION 5: AUXILIARY SYSTEMS

505 PIPING, HOSE AND VALVE REQUIREMENTS

505-1 General

505-1.1 Fluids may be conveyed by pipe, metallic tubing or hose as appropriate to the fluid being conveyed. Piping and hose shall be installed where it is accessible, but not where it may be subject to damage. Piping and hose shall be run as directly as possible with a minimum of bends and fittings. Piping shall be supported to prevent vibration.

505-1.2 All seawater piping systems shall be hose with stainless steel fittings.

505-1.3 Hose, end fittings and fire sleeves shall comply with SAE J1942. Hoses in fuel and hydraulic systems shall have stainless steel crimp-on or re-useable end fittings. A listing of all hoses on the RB-M shall be provided. (CDRL 505-001) Hose assemblies shall meet the requirements of COMDTINST M9000.6, Chapter 505, Section D.

505-1.4 Piping or tubing not part of purchased components shall be ASTM A269 Stainless Steel. Swagelok, Gyrolock or equal end fittings shall be used to connect stainless steel pipe or tubing. Piping fittings shall be stainless steel. The number of piping mechanical joints shall be minimized.

505-1.5 Valves for on/off applications shall be stainless steel flanged or threaded ball valves. Valves for throttling applications shall be needle valves.

505-1.6 The minimum test pressure for closed end piping systems is 50 PSI.

505-1.7 Piping and hoses that carry flammable fluids shall have spray shields on mechanical joints where spray could come in contact with energized electrical equipment or hot surfaces.

505-1.8 Hot piping shall be insulated and joints lagged. Chilled piping shall be insulated to prevent condensation.

505-2 Machinery and Piping System Drainage

505-2.1 Drain plugs shall be installed at low points in all piping systems or equipment that may entrap water, including components and parts of equipment. All drains shall be readily accessible for operation and maintenance.

510 CLIMATE CONTROL

510-1 General

510-1.1 The RB-M shall have a sea water cooled marine grade HVAC system for the pilot house, passenger and habitability spaces. System shall run off the boat's power and shore power. The system shall be able to maintain the following temperatures throughout all environmental conditions listed in Section 070:

Table 510-1 HVAC Temperatures

Maximum Allowable Temperatures Cooling		Minimum Allowable Temperatures Heating
Dry Bulb	Wet Bulb	Wet Bulb
80 Degrees F	68 Degrees F	55 Degrees F

510-1.2 *Reserved.*

510-1.3 Reject heat from the engines or jacket water heating system may be used to heat manned spaces.

510-1.4 Air conditioning (A/C) systems utilizing seawater as coolant shall be fitted with a seawater suction strainer that can be readily disassembled and cleaned. A/C seawater shall discharge over the side above the water line. A/C seawater pump shall be located where it is self-priming. Seawater piping system shall be arranged to simplify winterization. Condensate shall drain or be pumped overboard through a water seal trap.

512 VENTILATION

512-1 General

512-1.1 The spaces containing batteries or diesel stowage shall be ventilated in accordance with ABYC Projects H-32, and E-10. Ventilation blower switch(es) shall be located on the main console within easy reach of the helmsman.

512-1.2 All spaces shall be designed to minimize water intrusion.

512-1.3 Fans and opening ports shall be provided to aid in air circulation and crew comfort in the pilot house. Vents in manned areas shall have the ability to seal off those areas from outside air in case of an external chemical or biological contamination.

512-1.4 A separate exhaust fan shall be provided for the head area.

512-1.5 Combustion air shall be drawn from the engine room. Inlets shall be fitted with demisters and water traps which are self draining. Engine room temperature and depression shall not violate engine room installed equipments OEM recommendations. All air inlets shall be manually closed, opened and reset and shall automatically close when ordered to do so by the fire suppression system. All air inlets shall have a means to close the damper from outside the engine room space.

512-1.6 Ventilation system shall meet the requirements of SNAME Ship Technical Operation Bulletin 4-16, except that manned spaces shall be provided with a minimum of fresh air supply of 12 CFM per person.

512-1.7 Non-manned areas other than voids, tanks and exterior lockers shall be provided with ventilation.

521 DEWATERING PUMP AND FIREMAIN STANDPIPE

521-1 General

521-1.1 The RB-M shall have secure storage for a Coast Guard P-6 pump in a readily accessible location. The P-6 pump, its outfit, and container will be provided as Government Furnished Equipment.

521-1.2 The P-6 pump is a portable dewatering/fire pump that consists of a Darley Champion 2BE pump powered by a Honda GX-200 gasoline engine with a capacity of 250 gallons per minute at 12' suction lift. The pump and engine are mounted to an aluminum frame. The pump and its outfit (which includes a portable fuel tank, hoses, and instructions) are stowed in cylindrical watertight container that is 24 inches in diameter and 24 inches in height, with handles that extend 2 inches to on opposite sides of the container approximately 17 inches from the base. The weight of the combined pump, outfit and container is approximately 126 lbs.

521-1.3 The RB-M shall have an engine room suction standpipe with strainer to allow for removal of water from the engine compartment bilge with the portable P-6 pump.

521-1.4 The RB-M shall have a sea water suction standpipe for use with the P-6 pump. The standpipe shall be a single piece of pipe with skin valve to supply sea water to the pump. The skin valve shall be easily accessible. For operations using the Coast Guard P-6 dewatering pump, the pump shall be removed from the pump can and secured to the deck adjacent to a standpipe. The securing device shall not be a tripping hazard or interfere with other operations on the aft deck when not in use.

521-1.5 The connection points to the Coast Guard P6 Pump shall be PT Coupling Corp. quick connect/disconnect coupling part number 25A or equal, with a cap that is captured by a wire or chain.

521-1.6 Aluminum piping may be used for standpipes in lieu of hose.

529 BILGE DRAINAGE AND PUMPS

529-1 General

529-1.1 Each compartment shall have a submersible DC electric bilge pump to pump out any water that may accumulate. Each bilge pump shall have a capacity of at least 2,000 gallons per hour. Each bilge pump shall be piped so that it pumps directly overboard. A check valve shall be provided in the overboard piping. Each bilge pump shall be located so that it takes suction from the lowest point of the compartment.

529-1.2 The electric bilge pump control switch shall be located in the pilot house. The switch shall provide for on, off, and automatic operation and an indicator light that illuminates when the bilge pump is operating.

529-1.3 A bilge alarm system shall be provided in accordance with Section 436-2.

555 FIRE EXTINGUISHING SYSTEM**555-1 Portable Fire Extinguisher**

555-1.1 Portable fire extinguishers shall be installed in accordance with ABYC Project A-4, except that one B-II portable extinguisher may be substituted for two B-I portable extinguishers. Fire extinguishers shall be mounted at an interior location so that they are secure, but readily accessible.

555-2 Fire Suppression System

555-2.1 The RB-M shall have one fixed fire suppression system for the protection of the engine room. The system shall meet the requirements of 46 CFR 181.410, except as noted herein.

555-2.2 The storage cylinders shall be capable of local actuation using a lever on the control head, and remote actuation from pilot house.

555-2.3 A time delay shall be provided to prevent immediate discharge of gas. The fire suppression system shall not be capable of automatic discharge. The time delay shall have a manual release or bypass valve to override the time delay. The time delay shall be located outside the engine room and shall be accessible for operating the manual release.

555-3 Fire Alarm System

555-3.1 A fire alarm system shall be provided in accordance with Section 436-3.

561 STEERING SYSTEM**561-1 General**

561-1.1 The steering system shall meet the requirements of ABYC Standard P-22 with the exception that push-pull cable systems shall not be used.

565 TRIM CONTROL**565-1 General**

565-1.1 The RB-M shall have trim tabs or other means to control craft trim and heel while underway. Trim control and trim control indicators shall be provided at the helm station.

581 ANCHOR HANDLING SYSTEMS**581-1 General**

581-1.1 The RB-M shall have a Fortress model FX-37 nineteen pound anchor that is outfitted with 9' of stainless steel chain. The chain shall be attached to the anchor with a stainless steel shackle and fitted to the free end with a stainless steel shackle, swivel and thimble. The thimble shall be spliced in the eye of 300' 3" Double Braided Nylon Anchor Line (Breaking strength at least 30,000 lbs).

581-1.2 The anchor, chain, and associated shackles and fittings shall be sized and installed in accordance with ABYC Project H-40 (Storm Anchor category).

581-1.3 The assembled anchor shall be stowed in a bracket or locker that allows for secure, out of the way storage, that is readily accessible for emergency use on the foredeck. The anchor line shall be stowed on a mounted reel that is readily accessible for emergency use with the anchor.

581-1.4 A forward bitt or cleat and an opening centerline chock (“bullnose”) suitable for anchoring or towing the RB-M by another vessel shall be installed on the RB-M. The bitt or cleat and chock should be sized and installed in accordance with ABYC Project H-40.

582 MOORING, TOWING AND TIE DOWN FITTINGS

582-1 Towline Reel

582-1.1 A towline reel shall be provided and installed with a capacity of 600 feet of 3-inch circumference, double braided nylon line (breaking strength at least 30,000 lbs). The reel should be installed in a location that is readily accessible to the towing bitt. The bitter end of the line shall be attached to the reel.

582-1.2 The RB-M shall have mooring bitts (or cleats) and chocks, sized for the tow line, around the perimeter of the RB-M to allow for mooring and alongside towing of a variety of craft types.

582-2 Mooring and Securing Fittings

582-2.1 All mooring bitts and chocks shall be free of sharp edges that might cause damage to mooring lines or personnel.

582-3 Towing Fittings

582-3.1 An aft towing bitt shall be provided on the centerline. The towing bitt shall be sized to accept a round turn and three figure eights of the towline.

582-3.2 The RB-M towing bitt and fittings shall be designed with a factor of safety of 1.1 on the as welded yield strength of the fitting material under an applied load, equal to the 30,000 lb applied at the highest point of the fitting.

582-4 Tie Downs

582-4.1 Securing points shall be provided for positively securing the craft to the trailer for land transportation (see Section 084). Location of securing points shall not require tie downs to pass over the fendering.

582-4.2 Any installed lifting points, pad eyes, cargo tie downs shall have a working load limit indelibly marked on or adjacent to them. The point shall be pull tested to 150% of the Working Load Limit and test date indelibly marked on or adjacent to the point. A label plate will satisfy the marking requirements.

582-5 Hoisting Points

582-5.1 A hoisting system consisting of hoisting points and a lifting sling shall be provided to allow the craft to be lifted in the Hoisting Weight Condition. Hoisting fittings shall be located so that slings do not pass over the fendering. Each hoisting point shall have a safety factor of 6.0 based on the ultimate strength of the materials and the hoisting weight of the craft.

583 LIFERAFT

583-1 General

583-1.1 The RB-M shall be provided with a 6 man coastal life raft that is packed in a canister. The life raft shall be securely stowed in a readily accessible location and fitted with a hydrostatic release that will allow the life raft to float free. The stowage location shall also allow for the crew to manually deploy the life raft. Self-righting craft are not required to carry a life raft.

SECTION 6: OUTFIT AND FURNISHINGS**600 GENERAL OUTFIT****600-1 General**

600-1.1 The Contractor shall provide the RB-M fully outfitted with the items identified in Table 600-1, 600-2, 600-3, and 600-4.

Table 600-1 General Outfit

General Outfit	Quantity	Additional Information
Ensign, National (12" x 18")	1 Ea	
Ensign, US Coast Guard (12"x18")	1 Ea	NSN 8345-00-242-0275
RB-M General Information Book	1 Ea	See section 086-2
Equipment Operation and Technical Manuals	1 Set	See section 086-3
Ear Protectors (pair)	2 Ea	
Flashlight, Waterproof	2 Ea	
Search Light, Waterproof, Hand-Held, Battery Powered	1 Ea	
Blankets, Wool	4 Ea	
Pillows	2 Ea	
Bell, 6" (Removable With Bracket)	1 Ea	With bracket to meet Requirements of COMDTINST M16672.2
Binoculars, 7 x 50 Marine Waterproof	1 Ea	
Horn, Air, Portable with Propellant	1 Ea	
Deck Brush (10") w/ 6' Handles	2 Ea	
Bucket, 2 Gallon Molded Rubber	2 Ea	

Table 600-2 Navigation Equipment Outfit

Navigation Equipment	Quantity	Additional Information
Electronic Chart Data	As required.	To cover area from Cape May, NJ to Charleston, SC including entire Chesapeake Bay region.
Charts, Folded	12 Ea	To include:
		NOS Chart #1
		NOS Charts 12208, 12221, 12225, 12226, 12228, 12235, 12237, 12238, 12241, 12243, 12255
Coast Pilot	2 Ea	Volumes II and IV
Tide Current Chart	1 Ea	Atlantic Coast of North America
Tide Tables	1 Ea	East Coast, N & S America
Coast Guard Light List, Vol. II	1 Ea	
Navigation Rules International- Inland	1 Ea	COMDTINST M16672.2
CG Addendum to SAR Manual	1 Ea	GFE - 2" Thick 3 Ring Binder
Parallel Rule / GPS Plotter	1 Ea	Weems and Plath #130 or equal
Dividers	1 Ea	Weems and Plath #171 or equal
Slide Rule, Nautical	1 Ea	Weems and Plath # 105 or equal
Search Pattern Wheel	1 Ea	Weems and Plath #113 or equal
Pencils, #2	5 Ea.	
Pencil Sharpener	1 Ea.	
Stop Watch	1 Ea	
Penlight	1 Ea	

Table 600-3 Rescue and Survival Equipment Outfit

Rescue, Survival & Safety Equipment	Quantity	Additional Information
Pyrotechnics Storage Container	1 Ea.	Same as ammunition box, see Section 713-1.1
Personal Flotation Devices, Type I	5 Ea	Stearns Merchant Mate I or equal
Personal Flotation Devices, Type III	6 Ea	Life Saving Systems Model 320-CG
Survival Vests, Large	6 Ea	Life Saving Systems Model 217-CG
Damage Control Kit Bag	1 Ea	NSN 8465-01-117-8699
Grounding Wand (for helo ops)	1 Ea	NSN 5975-01-029-4176 (wand)
Grounding Wand Clip (goes w/ wand)	1 Ea	NSN 5999-00-047-4610 (clip)
Swimmers Harness w/ 70 feet line	1 Ea	Lifesaving Systems Model 202 or equal
Mask, Swim	1 Ea	Life Saving Systems Model 543 or equal
Fins, Swim	1 Ea	Life Saving Systems Model 546, size L, or equal
EMT Kit	1 Ea	Thomas AeroMed Model 890
First Aid Kit, 10 Person	1 Ea	NSN 6545-00-656-1093
Blood Borne Pathogens Personal Protective Equipment Kit	1 Ea	Med Protect Inc. Model 26592-L (ph. 800-945-4158) www.medprotect-inc.com
Stokes Litter with Flotation	1 Ea	Life Saving Systems Model 404-F (rigid) or Model 406-F (break apart)
Medevac Board	1 Ea	Lifesaving Systems Corporation Model 450 or equal
Boat Crew Safety Belts	4 Ea	Life Saving Systems Model 218
Boat Crew Safety Helmet	2 Xlarge	Life Saving Systems Model 458
	2 Large	
	2 Med	
Boat Crew Goggles	4 Ea	Life Saving Systems #535 or equal

Table 600-4 Mooring and Towing Equipment Outfit

Mooring and Towing Equipment	Quantity	Additional Information
Mooring Lines, 2-3/4" circ. x 30 ft	2 Ea	
Mooring Lines, 2-3/4" circ. x 60 ft	6 Ea	Also used as bridles
Heaving Lines, 100 ft	3 Ea	Life Saving Systems Model 227-H or equal
Fenders, Cylindrical. ~ 10" x 30"	4 Ea	
Chafing Gear, Removable	4 Ea	Perimeter Industries Model RCG125.14 or equal
Shackle, 3/4"	1 Ea	
Boat Hooks, 8 ft	2 Ea	
Grapnel Hook, Folding (5 lb) & 100 ft 3/8" DBN line	1 Ea	
Skiff Hook	1 Ea	Life Saving Systems Model 377 Clip and Model 667 Hook or equal

602 HULL AND MECHANICAL DESIGNATION AND MARKING

602-1 Boat Identification Plate

602-1.1 The RB-M shall have a manufacturer's identification plate. The plate shall be mounted in a suitable location on each craft. The plate shall include, at a minimum; the Contractor's name and address, the model number of the boat, a Coast Guard boat number, the words "Response Boat – Medium (RB-M)" and the year built. The Coast Guard boat number will be provided by the Government at the time an individual boat is ordered.

602-1.2 The boat identification plate shall be a minimum of 4" by 6" and be made of metal with black letters. The plate shall be a minimum of 3/16" thick.

602-2 Markings

602-2.1 The boat shall be marked port and starboard with the words "U.S. COAST GUARD" in block letters that are 6" high. Lettering shall be black and shall be placed in such a way so as to be highly visible from the side of the RB-M. The lettering shall be centered approximately in the middle of the RB-M, fore and aft. The Coast Guard number provided at the time a boat is ordered shall be affixed to the forward bows and transom and meet all other requirements of this section.

602-2.2 COMDINST M10360.3 shall be used for guidance in determining proper location and spacing of the lettering, with the exception that placing the lettering and numbering need not be limited to fendering or hull.

602-3 Label Plates

602-3.1 Each control, switch, gauge and valve shall be provided with a durable, permanently attached label plate to indicate its function.

602-3.2 Safety signs and labels shall be designed and installed in accordance with ABYC Project T-5.

602-3.3 The entrance to the engine room shall have a warning sign indicating the presence of a noise hazard. The sign shall be labeled “DANGER, NOISE HAZARD AREA –HEARING PROTECTION MUST BE WORN”.

602-3.4 Operating instructions shall be posted in accordance with COMDTINST M9000.6, Chapter 077, Section M.

602-3.5 All permanent notices and signs required by the OSHA, ABS, the US Coast Guard and the U.S. Public Health Service shall be mounted and sized in accordance with ABYC Project T-5.

604 LOCKS, KEYS AND TAGS

604-1 General

604-1.1 The pilot house door(s) shall be provided with a hasp-type mechanism that may be secured with a padlock.

612 RAILS AND HAND HOLDS

612-1 General

612-1.1 Rigid, fixed handrails and hand holds shall be located throughout the interior and exterior, for crew and passenger safety and efficient operation.

612-1.2 The RB-M shall be outfitted with a minimum of two hand holds at each seat location.

612-1.3 Handrails shall be set back from the deck edge, or angled, so they are not damaged during normal boat rolling motions when coming alongside another vessel or bulkhead.

612-2 Heavy Weather Safety Belt Attachment Points

612-2.1 The RB-M shall have safety belt rings located to allow a crew member to move about the exterior craft during different operations and be able to hook in when necessary. When operating in rough seas, crew members wear a heavy weather safety belt. The belt is worn around the waist and has two 3-ft straps with quick disconnect clasps at the end of each strap. The crew member will hook the clasps to attachment points (safety belt D-rings) located around the boat. The D-rings are ½ inch rod welded to the craft. The rings are approximately 2 ½ inches long and 4 inches wide.

625 WINDOWS, DOORS, AND HATCHES

625-1 Windows

625-1.1 Windows, frames and supporting structure shall be watertight.

625-1.2 Each forward facing windshield shall have a wiper system with a window washing system.

625-1.3 All enclosed bridge windows shall have means of defrosting and defogging. Controls for the defrosting and defogging equipment shall be within easy reach of the crew on the bridge.

625-1.4 Forward facing windows shall be heated, tempered safety glass. Others may be made of polycarbonate with scratch-resistant coating.

625-1.5 At least one window on each side of the pilot house shall be capable of opening for ventilation.

631 COLORS, COATINGS, AND FINISH

631-1 General

631-1.1 All colors, coatings and finishes shall be in accordance with COMDINST M10360.3. Bottom anti fouling paint shall be applied for use in a salt water environment.

631-1.2 The console shall be sheathed or coated to minimize glare from lights and electronics during night operations. Coatings or sheathing shall be highly scratch-resistant.

631-2 Aluminum

631-2.1 All exposed aluminum surfaces on the exterior of the craft shall have a uniform natural or satin finish/texture defined as:

631-2.1.1 A surface profile that does not exceed 1.0 mils as measured by Testex Press-O-Film replica tape (coarse 0.8-2.0 mils).

631-2.1.2 Spherically shaped indentations with a diameter less than or equal to 0.2 mm as measured by an optical comparator such as a Fowler 7x Comparator with a #7 Reticle.

631-2.2 Application of a satin finish may be achieved by a glass bead blast with the following parameters:

631-2.2.1 Media - glass bead size #8 using designation no. AGB-18 (U.S. sieve size 70-100) using SAE Standard AMS-2431a or equivalent.

631-2.2.2 Air pressure - 80 PSI.

631-2.2.3 Nozzle tip - 7/16".

631-2.2.4 Nozzle angle - 75°-90° to the surface.

633 CATHODIC PROTECTION

633-1 Sacrificial Anodes

633-1.1 The RB-M shall have sacrificial anodes for cathodic protection installed in accordance with ABYC Project E-2 for a salt water environment.

634 DECK COVERING

634-1 General

634-1.1 All exterior decks must be provided with non-skid surface that shall be 3M Safety Walk (coarse) or equal slip resistant sheets as defined by COMDTINST M10360.3.

634-1.2 All interior pilot house decks shall be provided with resilient non-skid deck coverings.

634-1.3 Interior machinery space decks shall be provided with quick release removable (without tools) deck panels or grates.

635 THERMAL INSULATION AND ACOUSTIC ABSORPTIVE TREATMENT

635-1 General

635-1.1 Insulation shall be installed over watertight boundaries only after all specified tightness tests have been completed.

635-1.2 Fastenings shall not crush or otherwise reduce the insulating value of the insulation.

635-1.3 Vapor barriers shall be applied to all insulation as necessary to prevent penetration of moisture, shall remain intact and continuous over the area protected by means of sealed joints and edges and shall not have any holes or voids in any single coat of vapor barrier coating.

635-1.4 Insulation shall be installed in such a way to prevent damage from water absorption or physical damage.

644 MARINE SANITATION AND HABITABILITY

644-1 Head Facilities

644-1.1 The RB-M shall have head facilities of the portable chemical type located in a compartment that will provide crew privacy. The head facility shall be mounted for easy removal.

644-1.2 The RB-M head facilities shall have grab rails, a toilet paper holder, a small trash receptacle with a sealed top and a Handiwipes type dispenser.

644-2 Habitability

644-2.1 The RB-M shall have a portable system that will provide potable water from a removable potable water tank (5 gallon capacity minimum) to a galley sink. The sink shall have an overboard drain containing an inline check valve and a hull valve. A removable jug (5 gallon capacity) with faucet may be used in lieu of a tank.

644-2.2 The RB-M galley shall have a microwave capable of heating single serving drinks and meals, a paper towel dispenser, a sealed trash can, a Handiwipes type dispenser, and cooler (minimum 36 quart) with cooler tie down. Additional storage of at least 1 cubic foot in volume shall be provided for supplies and food.

644-2.3 Standard sports water bottle holders shall be provided at each crew member's seat.

660 OPERATOR AND CREW STATIONS

660-1 Operator and Crew Seating

660-1.1 The RB-M shall have fixed shock mitigating seating for the four crew members. Seating shall provide for safe, comfortable support of the crew in high speed, rough weather operations. Seats must be adjustable to accommodate different body types including seat height and fore and aft location. Seating shall have seat belts.

660-1.2 Seat materials shall provide comfortable support of the seated person and shall be fabricated of durable marine grade materials. Materials shall be resistant to tearing and puncturing, and not significantly degrade or fade under exposure to sunlight and saltwater.

660-2 Passenger Seating

660-2.1 Passenger seating shall be provided for the full complement of five passengers. The seating may allow the ability to carry a casualty in a Stoke's litter while providing medical assistance. The survivor, while in the Stoke's litter, may take up the space of up to three passenger seats. Seating shall have seat belts.

670 STOWAGE

670-1 General

670-1.1 All loose components shall be provided with positive means to hold them in the accelerations and angles listed in Section 051-3.

670-1.2 Storage for the outfit items in the Specification, including but not limited to Table 600-1, 600-2, 600-3, 600-4 and any other items the Contractor deems necessary for the safe operation of the RB-M, shall be provided. Storage locations shall suit the items being stored and shall prevent damage and wear to items being stored. Access and arrangement shall permit immediate access to items used on a regular basis. All items, with the exception of the boat hooks, require, at a minimum, weathertight storage. The Contractor shall provide all items listed in Table 600-1, 600-2, 600-3, and 600-4 of this document.

670-1.3 The RB-M shall have stowage space and weight margin for the damage control kit. The damage control kit is stowed in a duffle bag (shown on outfit list) that is 37" long and 12.5" in diameter when full, and weighs approximately 21 lbs.

670-1.4 The RB-M shall have stowage space and weight margin for the Emergency Medical Technician (EMT) kit. The EMT kit is stowed in a Thomas AeroMed bag (shown on outfit list) and weighs approximately 10 lbs.

670-1.5 The RB-M shall have dedicated interior storage and weight margin for four crew personal effects duffle bags. Each bag is 22 inches long, 12 inches wide, and 20 inches in height and weighs approximately 15 lbs when full.

670-1.6 The RB-M shall have dedicated interior lockable stowage and weight margin for stowage of survival vests. The vests, when in service, will be outfitted with survival gear, including pyrotechnics, to fill the vest pockets. When fully outfitted the vests will weigh approximately 4 pounds each.

670-1.7 The pyrotechnics stowage container shall be stowed in a lockable interior location.

670-1.8 The RB-M shall have at least 5 cubic feet of interior stowage for miscellaneous outfit not otherwise included in this specification.

670-2 Tools, Tool Storage, and Onboard Spares Outfit

670-2.1 A tool box with basic tools for emergency underway repairs and frequent preventive maintenance shall be provided.

670-2.2 The RB-M shall be outfitted with onboard spares of the type and quantity shown in Table 670-2.

Table 670-2 Onboard Spares Outfit

Mechanical Spare Parts and Tools	Quantity	Additional Information
Drive Belts	1 of Ea Type	
Fuel Filters	2 of Ea Type	
Fuses	2 of Ea type	
Rubber Impellers	2 Ea	
Light Bulbs	2 of Ea Type	
Oil Filters	2 Ea	
System Fluids	4 Quarts Ea	

SECTION 7: ARMAMENT

703 WEAPON STOWAGE

703-1 General

703-1.1 Interior lockable stowage shall be provided for four 9mm hand guns, two M60, Light Machine Guns (LMG), one M16 rifle, and one Remington 870 shot gun.

710 WEAPON MOUNTS

710-1 General

710-1.1 The RB-M shall be outfitted with at least two weapon mounting points to accommodate up to M60 LMGs.

710-1.2 The RB-M shall have foundations and pedestals for the placement of the MK16 MOD 0 pintle type weapon stand. The foundations shall be adequate to support the peak recoil loading of the M60 7.62mm machine gun and shall be designed with a safety factor of two on the yield strength of the material. The peak recoil of an M60 machine gun is 350 pounds.

710-1.3 The MK 16 MOD 0 mount has provisions to restrict the arc of fire of the LMG. The base of the mount requires a foundation which has a horizontal surface with bolt holes to accommodate four equally spaced 5/8 inch diameter bolts on a 4-3/4" bolt circle with sufficient access below the foundation plate to access the bolts. For proper operation this foundation shall be no less than 30-1/2" and no more than 39" above the deck on which the gunner will be standing.

713 AMMUNITION STOWAGE

713-1 General

713-1.1 Secure, lockable stowage shall be provided for a minimum of four M19A1 ammunition containers. Each container is 11" x 3.812" x 7.25". The weight of the container with ammunition is 17.8 lb.

SECTION 9: TRAILER SPECIFICATION

900 TRAILER

900-1 Trailer Requirements

900-1.1 The Contractor shall provide a trailer for transporting the RB-M which is suitable for use with a semi-type truck. The trailer shall comply with all Department of Transportation and U.S. Federal Motor Vehicle Safety Standards and shall be capable of transporting the RB-M via road using routine permits throughout the continental United States (see 49 CFR 100-170). The trailer shall be set up for the RB-M, suitable for immediate use, and shall have a minimum load rating equivalent to the Hoisting Condition (see Section 096) plus 1500 pounds of equipment.

900-1.2 The trailer shall allow for ease of on-loading and off-loading the RB-M and shall fully support the craft in such a way as to prevent movement while being transported or any damage to the craft from long term storage on the semi-trailer or semi-trailer/cradle combination. Sufficient support shall be provided to prevent excessive bearing pressure or significant bending of the craft.

900-1.3 If used, cradles shall be Contractor furnished and will be both acceptable for boat or craft shipment and certified that the cradle complies with the requirements specified herein and the carrier rules.

900-1.4 The Contractor shall assure that the trailer or trailer/cradle combination satisfies the requirements specified herein and such will provide safe transportation of the boat or craft to its destination. The trailer is not intended for ramp launching of the RB-M.

900-1.5 If it is necessary to remove items for transport, those removed items shall be match-marked to facilitate reassembly. Removed items shall be tagged, marked and the tags attached to each mating item. The tags and printing thereon shall be resistant to oil, water and fading.

900-1.6 The Contractor shall provide tie down straps to secure the RB-M to the trailer using the suitable attachment points.

900-1.7 If the trailer has hydraulic arms the hydraulic cylinder rams shall be stainless steel and a means shall be provided to mechanically lock the arms in place in case of hydraulic failure.